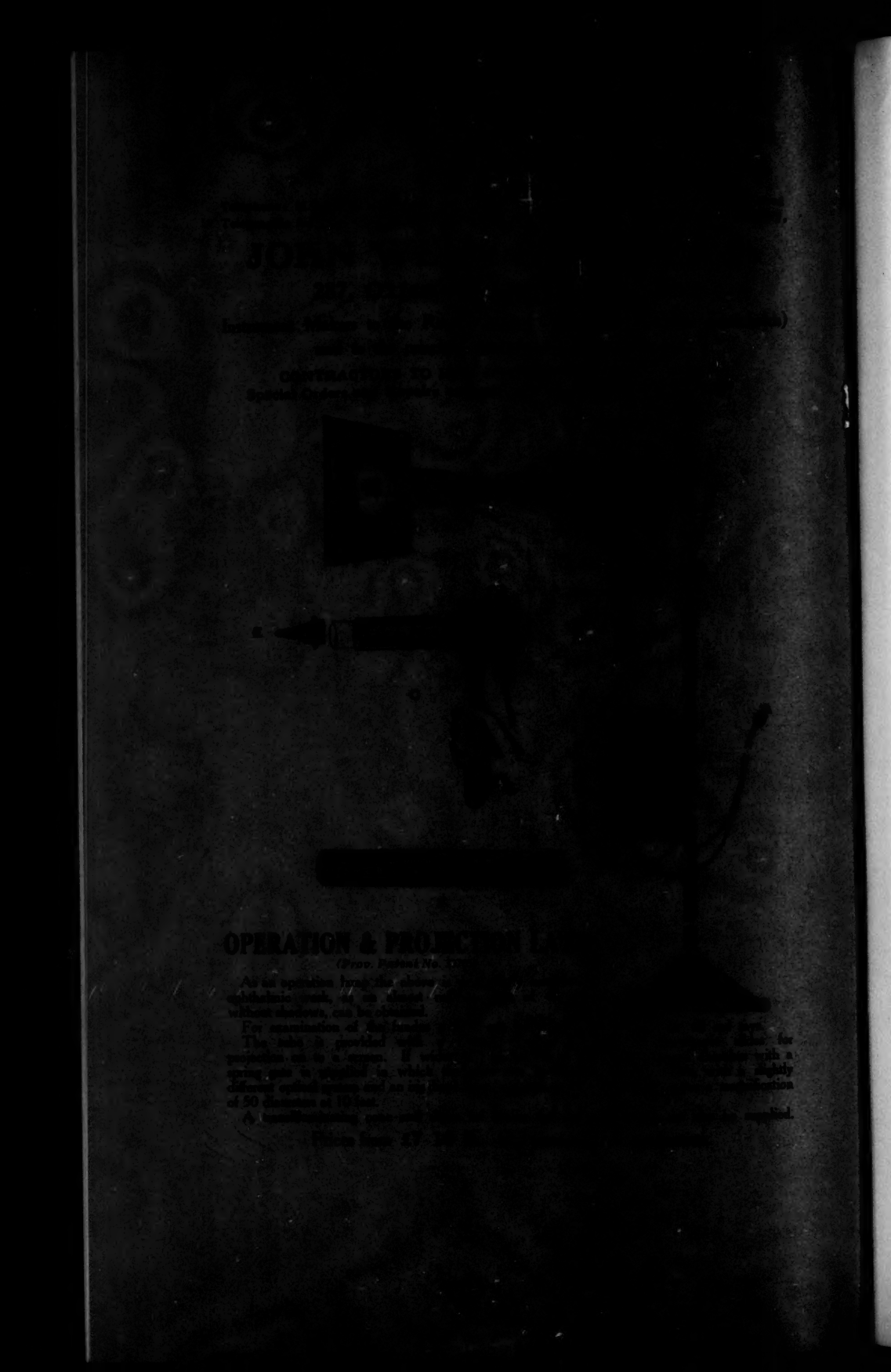

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COMMUNICATIONS

PERISCOPIC LENSES

BY

ARCHIBALD STANLEY PERCIVAL

NEWCASTLE-UPON-TYNE

THE object of periscopic lenses is to enable the patient to see distinctly when ranging his eyes from side to side instead of being obliged to move his head, as is necessary when strong convex glasses are used. The problem of designing such lenses has been attacked by many workers for more than thirty years.

In 1898 Ostwalt did some excellent work which first directed my attention to the subject; three years afterwards I published a preliminary paper in Knapp's *Archives*. In 1908 Tscherning showed that for a certain range of convex glasses the astigmatism due to oblique vision through them can be entirely obviated, and that whenever this is the case, there are two forms of meniscus that will serve the purpose; one, a deep meniscus (Wollaston's), the other, a shallower form (Ostwalt's); he also published an elliptical curve from which these two forms of meniscus for any power within this range could be easily read off. Gullstrand about the same time showed that by means of *aspherical* surfaces the range of powers that could be entirely freed from astigmatism was greatly increased. These Katral lenses have to be worked by hand and are enormously expensive. In 1908 Tscherning published some tables, both for distance and for close work (*Receuil d'Ophtalmologie*) of all the powers 1 to 20D., both convex and concave,

both periscopic and orthoscopic, that would best attain his object. The mathematical method he used (based on Czapski's formulae) is described in detail in the last edition of the *Encyclopédie d'Ophtalmologie*. We are all deeply indebted to Professor Tscherning for this magnificent work, but I think our master has made a slip. His orthoscopic lenses have been calculated with the greatest care to correct as far as possible the distortion and the curvature in the peripheral parts of the field on eccentric vision. But I contend that this is unnecessary. The eye is not like a photographic plate, equally sensitive all over; it is only the macula that can distinguish minute details of form. M. Dor has taught us that 5° from the fixation point the visual acuteness has diminished to 0.25 and at 10° to 0.066 of that at the macula. If the eyes be fixed on one letter of this Journal it will be found that the fourth letter on either side cannot be distinguished. Surely to the eye it is a matter of entire indifference whether the peripheral parts of the field are accurately focussed or not, they cannot be distinguished in any case.

We have all received advertisements of Punctal and Katral lenses with photographs of test types to show the advantage gained by these lenses in the definition of the peripheral parts of the field. I grant that they are far better for photographic purposes, but I maintain that such pictures are of no evidence to show that they are useful for visual purposes. The optical conditions are entirely different. The photographic lens is provided with a *fixed central* stop; the periscopic lens is provided with a *movable* stop (the pupil), and so gives a well defined macular image of the eccentric part of the field under examination when the eye ranges to one side. The macula is far more sensitive than any photographic plate, even to a thousandth of a millimetre, but at a short distance from the fovea all this extraordinary sensitiveness is lost. However, as the mathematical method involved in the calculation of these Punctal and Katral lenses has not been published (it is I believe a patent process), they belong to the class of secret remedies that cannot be here reviewed.

Recently Mr. Whitwell has published in the *Optician* some work that is based on Gleichen's formulae; he has also dealt with the subject of prescribing sphero-cylinders in a periscopic form. I must mention also a valuable paper of his in the same periodical on the important part that binocular vision plays in the apparent curvature of the field.

It will be well to take an extreme instance to show the nature of the defects in macular vision that arise from the ordinary biconvex lens. Suppose that an aphakic is given a +14 D. for reading at a distance of 30 cm. from the plane of his glasses. If he rotates his eyes 30°, there will be formed by this peripheral part of his reading

glass two focal lines, the first (v') at a distance of −39.02 mm., and the second (v") at a distance of −65.65 mm. behind the glass.

Now $D' = \frac{v' - p}{v'p}$ in metres.

Here p is the distance of the object, but it is not now 0.3 m. for it is the slant distance at 30°, say 0.3 sec. 30°m. or 0.34641 m. (This is not exact, for we are neglecting the prismatic effect of viewing an object through an eccentric part of the lens.)

$$\text{Then } D' = \frac{-0.03902 - 0.34641}{(-0.03902)(0.34641)} = \frac{-0.38543}{-0.0135169} = +28.515\text{D.}$$

Similarly in the other meridian for the second focal line (v")

$$D'' = \frac{-0.06565 - 0.34641}{(-0.06565)\ (0.34641)} = \frac{-0.41206}{-0.0277418} = +18.119$$

The astigmatism of this biconvex lens when viewed eccentrically at an angle of 30° is D'−D," that is 10.395 D.

Further, we must find what should be the effective power of this lens when thus viewed eccentrically by an aphakic. As+14D. is the correction for centric vision at a distance of 0.3 m., the image must be formed at q, where

$$q = \frac{p}{1 - pD.} = \frac{0.3}{1 - 4.2} = -0.09375\text{ m.}$$

Now if p for eccentric vision be regarded as 0.34641, we have

$$D_1 = \frac{q - p}{qp} = \frac{-0.44016}{-0.0324476} = +13.5534\text{D.}$$

Indeed, if we neglect the prismatic effect of the lens, whatever be the lens required for centric vision, for eccentric vision at this angle of 30°, its converging power should be made less by −0.4466D., for that is the lens that will form an image at 0.3 m. of an object at 0.34641 m.

Clearly then the biconvex lens not only has a huge astigmatic error, but its power when viewed eccentrically is far too great, so that the unfortunate patient would be obliged to move his head for almost each word that he reads.

The method that I have adopted is different I believe from that of all other workers on the subject in several details. In the first place the range of *rotation of the eye is* taken to be 30° in any direction from the primary position, it is not the extent of the *field of vision*; indeed the field is rather greater for concave glasses and less for convex glasses. Then I have calculated the radius of the circle of least confusion given by the meniscus when the eye is directed 30° from the middle line, and I then find *r*, the radius of its retinal image (given in the Tables for convex lenses), using Tscherning's last constants for the eye which may be found in his

Physiologic Optics (1924). I endeavour to obtain a retinal image of this circle less than that of a macular cone, the radius of which is 0.001 mm. I give the residual astigmatism uncorrected in the column marked As., found as in the above instance with the +10D. biconvex; and I pay due regard in the case of reading glasses to the back focal distance of the lens from an object that is viewed eccentrically. As shown above the power of a convex reading glass should be about 0.5D. less for extreme eccentric vision, while that of a concave reading glass should be about 0.5D. greater (*i.e.*, more concave) than that required for centric vision.

This is a point that seems to have been neglected by most other workers on the subject. My method was, I hope, clearly explained in the July number of ***The Ophthalmoscope***, 1914, although there I did not allow for the thickness (t) of the lens in estimating its effective power, and the calculation was made for an angle of 25° instead of 30° as in the following table. As indicated above, my attention has been wholly concentrated upon the macular vision, and I have given the ocular curvature in dioptres which can be ground with the ***ordinary tools*** in use. My Tables differ very widely from Professor Tscherning's who uses a deeper form of meniscus for which in nearly every case a special tool will have to be made. Without any doubt this gives far better photographs, but as I have explained I do not think that is any evidence of superiority as spectacle lenses.

I have taken 3.2 mm. as the average diameter of the pupil in the iris plane (practically about 3.5 mm. in the first principal plane of the eye), and μ to be 1.523, which is the average British (and the standard American) value for the refractive index of spectacle glass. It would be quite possible to give an ocular curvature which would make this residual astigmatism vanish for powers up to + 7D., but often at the expense of making the eccentric power of the lens so faulty as to be practically useless; in addition the curvatures of each surface must be given to four decimal places, for which there are at present no available tools. It will be found that with my ocular curvatures r (the radius of the retinal confusion circle) is less than 0.001 mm. up to + 7D. for distance, and indeed up to + 8.5D. for close work. Beyond these powers completely satisfactory results could only be attained by means of the hand-made aspherical surfaces originated by Gullstrand.

However, the forms given up to + 14D. give the best results with ordinary spherical curvatures, and are quite satisfactory for smaller angles than 30°. It will be seen that by giving the + 14D. an ocular curvature of − 4.5D. the astigmatism is reduced from 10D. with a biconvex lens to less than 1.5D. for oblique vision at 30° and the eccentric power at this angle is between + 14.71D. and + 13.25D. I have taken my very worst example in the second

Table, but such a lens for reading is of enormous advantage to an aphakic. If horizontal astigmatism is present, as is usually the case, it can be easily corrected by tilting the lens.

TILTING SPHERICAL 10D. LENS μ=1.523.

Obliquity.	Spherical.	Cylindrical.
15°	10.23	0.723
20°	10.38	1.3746
25°	10.64	2.3132
30°	10.95	3.6488

The cylindrical effect of tilting a + 14D. lens 20° is 1.4 × 1.3746 or adding a convex cylinder of 1.924D. with its axis horizontal. The astigmatism tends to disappear in these operation cases, and it is only required to bend the legs of the spectacles upwards to lessen the cylindrical effect.

A solid angle of 60° is a very generous allowance; the printed line of this Journal at 32.7 cm. from the centre of rotation (or 30 cm. from the plane of the glasses) only requires a range of movement less than 10° to either side of the middle line, *i.e.*, less than a solid angle of 20°.

In the case of reading glasses, as indicated above, adjustment has been made as far as possible for viewing a flat object. It will be noted that periscopic lenses for near work are entirely different from those for distance. This is a point that is apparently unrecognized by the Jena School of Optics, and as far as I know Tscherning is the only previous publisher of such a table. *In Henker's Theory of Spectacles*, published by the Jena School, no indication of the curvatures of even the distance lenses is given, but on page 129, we learn to our surprise that their periscopic lens of + 8D. gives an astigmatism of 1.83D. "on refraction at the periphery," which I suppose means at an angle of 30°, as that is the extreme angle mentioned when dealing with the subject of periscopic vision. On the next page we find that their Punctal lens of + 8D. gives only an astigmatism of 0.05D. My reading periscopic compares very favourably with their Punctal lens, although my distance glass made with ordinary tools is not so good.

In order to show these lenses in a comparable manner the values given for r have been calculated in the same way for each case as for normal eyes; they are not true for aphakic eyes. In aphakia the size of the pupil varies very greatly in different cases, so that no exact determination of r can be given; it may be assumed that usually in aphakia r will be about half as great again as the value given in the Table.

We have all had patients who complained of the curvature of the field when high periscopic lenses were used; in most if not in all such cases it will be found that the lenses have too high a power. For instance for a + 10D. lens on a − 7D. base, the anterior curvature will be found to be + 17D. But such a lens has an *effective* power of + 18D. owing to the displacement forwards of the second principal point. The true formula for the anterior surface I gave in this Journal in 1924 (page 372) $d_1 = \frac{\mu\ (D-d_2)}{\mu + t\ (D-d_2)}$ and is therefore + 16.1. I maintain now that the common complaint of curvature of the field is due to this cause, it has nothing to do with the real curvature of the image field, for in all my recent cases attention to this point has relieved the patients of all their symptoms. For this reason the value of *t*, the axial thickness of the lens, is a very important matter and it must not be less than that indicated in the Table, at any rate up to+7D. As the higher powers are not truly periscopic up to an angle of 30°, they may be made smaller and thinner as they will then be lighter. The method of determining *t* is explained below in the case of a + 10D. plano-convex lens or indeed of a lens of that power bounded by spherical surfaces of any curvature.

A periscopic lens will be of somewhat large size, say 40 mm. in its greater diameter (an 00 eye as it is called); if then such a disc be ground to a convexity of +10D. (*i.e.*, a curvature of radius 52.3 mm.), until the edge is indefinitely thin, its axial thickness will be r (1−cos θ). But we do not know cos θ, we only know sin θ which is $\frac{p}{r}$, where p is one half the diameter of the lens or 20 mm.

So $r - \cos\Theta = r - r\sqrt{1-\sin^2\Theta} = r - \sqrt{r^2p^2}$.

and $52.3 - \sqrt{2735.29 - 400} = 52.3 - 48.32 = 3.98$ mm.

As the lens must be at least 1 mm. thick at the edge we add 1 mm. to this value, and obtain 4.98 mm. as the minimum thickness *t* of this +10D. lens.

Practically a fairly good estimate of the thickness of a lens of any power D. and of width 40 mm. can be obtained by using this empirical rule:—

$$t = 1 + 0.4D. = 5 \text{ mm. if } D. = 10$$

The distance of the lens from the eye must also be carefully considered, as a small variation in this will destroy the full periscopic effect of the most perfectly designed meniscus. My calculations are based on the assumption that the distance (BM.) from the ocular surface of the meniscus to the "centre of motility" (M.) of the eye is in every case 27 mm. The usual distance of M. from the apex of the cornea seems to be 13.4 mm., so that allows a distance of 13.6 mm. between the cornea and the correcting glass which will be quite enough to avoid contact with even long eyelashes. The distance allowed for this purpose is variable, Henker gives 12 mm. as the distance accepted at Jena, this I feel is not enough for

most patients, at the same time I think that the usual allowance of 15 mm. is unnecessarily great.

We have found that for a + 10D. lens, when μ is 1.523, t is 4.98 mm., or 0.00498 m., for in all dioptric formulae the metre must be taken as the unit. D is the *effective* power of the lens, such that its second principal focus will be formed at a distance of 100 mm. from its posterior surface, as in the case of a+10D. trial lens placed 13.6 mm. in front of the cornea. In this case $d_2 = -7$, so $D - d_2 = 10 + 7 = 17$, and according to the formula

$$d_1 = \frac{17 \times 1.523}{1.523 + 17 \times 0.00498} = 16.104773 D.$$

The *real* power of this meniscus (+ 16.104773 D. and − 7 D. where t = 4.98 mm.) is 9.4734D., and its focus is formed at 105.5587 mm. behind the second principal point, which is 5.5587 mm. in front of the ocular surface of the lens. The *effective* power of the lens for the correction of refractive errors is therefore exactly that of the trial +10D. lens placed in the correct position before the eye. The *real* power (+ 9.4734D.) of this meniscus we have to consider when we are dealing with the size of the image and other problems. It will be noted that the values of d_1 in the Tables are only given to two decimal places, as they only indicate what should be aimed at; it is always better to prescribe an anterior curvature less rather than greater than the stated value of d_1. The correct form of a +10D. lens for distance is $\frac{+16D}{-7D.}$ which will be quite satisfactory to the patient.

Now if a periscopic sphero-cylinder is required, we encounter great difficulties, as toric lenses are only made on a basis of 3D., 6D. and 9D., so that unless special tools are made for the purpose some thought must be given to the matter before the best attainable correction can be prescribed. It is usually better to make the anterior surface a convex toric, and the ocular surface a spherical concave; otherwise with a concave toric, if the cylinder be fairly high, although in one meridian the curvature may be appropriate, it will be hopelessly wrong in the other: it will be noticed in the Table that the convexity of the anterior surface increases much more rapidly than the change of concavity of the ocular surface. Further, I would point out that the change in the concave surface is not uniform, the concavity first increases and then diminishes, this change occurs when there is a change of sign in the incident angle.

Suppose that + 2D. sph. + 3D. cyl. ax. 90° is required in periscopic form for reading. The Table shows that between + 2D. and + 6D. the ocular curvature should be between − 4.25D. and − 4.5D., so an

ocular curvature of − 4.25D. should give a very good result, and we may write tentatively this prescription, subject to further testing.

$$\frac{+\ 6\text{D. cyl. ax. } 0^\circ \textit{ cum } +\ 9\text{D. cyl. ax. } 90^\circ}{-\ 4.25\text{D.}} \quad \text{Toric surface anterior.}$$

Testing the prescription. From the Table it is seen that in order to obtain a power of + 2D. on a concave surface of − 4.25D. with a thickness of 1.77 mm. the anterior curvature should be + 6.2D., but this lens must have the thickness of a + 5D. glass. By the rule for t previously given

$$t = 1 + 0.4\text{D.} = 1 + 2 = 3 \text{ mm.}$$

It is required to find the *effective* power D. of this meniscus in the two meridians. By a simple transposition of the formula given on page 374 it is seen that $\mu\ (D - d_2) = d_1\ \mu + d_1\ t\ (D - d_2)$ or $D - d_2 = \frac{d_1\ \mu}{\mu - d_1\ t}$

(1) In the horizontal meridian $D' - d_2 = \frac{9\mu}{\mu - 0.027} = \frac{13.707}{1.496} = 9.16$

$$\therefore\ D' = -4.25 + 9.16 = 4.91$$

(2) In the vertical meridian $D'' - d_2 = \frac{6\mu}{\mu - 0.018} = \frac{9.138}{1.505} = 6.07$

$$\therefore\ D'' = -4.25 + 6.07 = 1.82$$

The effective value of this periscopic lens is therefore

$$+\ 1{\cdot}82\ \text{D.} +\ 3.09\ \text{D. cyl. ax. } 90.^\circ$$

The spherical correction is 0.18 too small (which is in the right direction), and the cylinder is 0.09 too great. This will be the right addition to make to a + 3 D. cyl., as found for the distance, if required for reading and + 2 D. has been given for the presbyopic correction; as explained in my paper on the "Alteration of the power of a cylinder when used for close work" in this Journal last year (page 8). The prescription can then be given with full confidence.

Now if the same prescription + 2 D. + 3 D. cyl. ax. 90° were required in periscopic form for distance, it is a far more troublesome matter. From the Table the ocular curvature should be that of − 6.5 D., but no suitable toric glass such as + 8.36 cyl. ax. 0° *cum* + 11.36 cyl. ax. 90° can be supplied without having special tools made for the purpose.

If we are limited to the available toric surfaces we must consider the relative merits of:

(1) An anterior toric of +9 D. cyl. ax. 0° *cum* + 12 D. cyl. ax. 90°.

(2) An ocular toric of −6 D. cyl. ax. 90° *cum* − 9 D. cyl. ax. 0°.

(3) An ocular toric of − 3 D. cyl. ax. 90° *cum* − 6 D. cyl. ax. 0°.

At the first glance remembering that the ranging movements of the eyes are chiefly in the horizontal direction one would be inclined

to choose (2) as it will give the best curvature − 6 D. in this meridian. This is true, but it will not correct the astigmatism when ranging the eyes in *all* directions as is so necessary in sport and outdoor games.

Certainly (1), bad though it is, will give the best result for *all* lines with a limited range of movement; at any rate it will be far better than the ordinary sphero-cylinders for such as lawn tennis players who require periscopic vision in all directions. This consideration will show the very common error of some opticians in making periscopic lenses always on a toric base of −6 D.

(For reading glasses a toric ocular surface would be allowable, although for really accurate vision the head must be depressed for every three or four lines, while for ranging movements of the eyes from side to side this ocular toric arrangement would serve very well. But unfortunately torics are not made in any of the powers required from −4.25 to −5.50.)

We must find the best value to give to the ocular curvature (d_2) by using the same formula as before $D. - d_2 = \frac{d_1 \mu}{\mu - d_1 t}$

(1) $D' = 2$ and $d_1' = 9$, (2) $D'' = 5$ and $d_1'' = 12$

(1) $2 - d_2' = \frac{9\mu}{\mu - 0.027} = \frac{13.707}{1.496} = 9.16$

(2) $5 - d_2'' = \frac{12\mu}{\mu - 0.036} = \frac{18.276}{1.487} = 12.29$

$\therefore d' = 2 - 9.16 = -7.16$, and $d_2'' = 5 - 12.29 = -7.29$

The prescription $\frac{+ 9\text{D. cyl. ax. } 0^\circ \textit{ cum } + 12\text{D. cyl. ax. } 90^\circ}{-7.25\text{D. sph.}}$

is then the best obtainable with the stock tools in the workshops.

We may then reasonably order the ocular curvature to be −7.25D. It is, however far from perfect, the effective power of this meniscus will be +1.91D. sph. *cum* + 3.13D. cyl. ax. 90°, and owing to the ocular curve being −7.25D., the result will not be periscopic for a range of 30° on either side of the middle line, though probably for a range well over 20°.

From these examples it is hoped that the procedure in dealing with periscopic sphero-cylinders will be now quite clear to those who have a taste for such problems. I have said enough to show that it is not fair to expect the busy optician to spend the time and thought required for them. Ophthalmic surgeons who have no taste for these things I strongly recommend not to order periscopic sphero-cylinders; to some however there is a special interest in working out the best possible meniscus with the available tools.

TABLE OF CONVEX PERISCOPIC LENSES FOR DISTANCE

Solid Angle of 60° ; $\mu = 1.523$

D	t	Ant. Surf.	Ocular Surf.	As.	r
+ 2	1.77	+ 8.42	− 6.5	0.00210	0.0000327
+ 4	2.54	+ 10.32	− 6.5	0.00857	0.0001374
+ 6	3.33	+ 12.64	− 7.0	0.01510	0.0002504
+ 8	4.14	+ 14.41	− 7.0	0.14956	0.002576
+ 10	4.98	+ 16.10	− 7.0	0.42782	0.007681
+ 12	5.86	+ 17.49	− 6.75	0.90829	0.017103
+ 14	6.79	+ 18.15	− 5.75	1.57969	0.03133

TABLE OF CONVEX PERISCOPIC LENSES

Distance 30 cm. from Spectacle Plane

D	t	Ant. Surf.	Ocular Surf.	As.	r
+ 2	1.77	+ 6.21	− 4.25	0.001602	0.00002433
+ 4	2.54	+ 8.14	− 4.25	0.00323	0.00005216
+ 6	3.33	+ 10.26	− 4.50	0.00499	0.0000784
+ 8	4.14	+ 13.02	− 5.50	0.01627	0.0002651
+ 10	4.98	+ 14.30	− 5.00	0.27045	0.0045496
+ 12	5.86	+ 15.96	− 5.00	0.7535	0.01327
+ 14	6.79	+ 17.09	− 4.5	1.4475	0.02679

It only remains to add a few words about concave periscopic lenses. Spherical concave lenses are much more amenable to periscopic treatment, as they can be made entirely satisfactory up to powers over − 20D. with a minimum amount of residual astigmatism and a tiny retinal confusion circle smaller than a macular cone. For this reason I have omitted the two columns for r and As. I have also omitted the column for t as the axial thickness is always 1 mm. There is no necessity to calculate the anterior curvature, for as will be seen there is only occasionally an alteration in the second decimal place of its anterior dioptric power. There is however an even greater difficulty in dealing with spherocylinders in this case, for it will be noted from the table that with

each change of power there is a change in the ocular as well as in the anterior curvature. It will make little difference whether we make the anterior or the posterior surface toric, the result will not be fully periscopic in either case; for an accurate periscopic sphero-cylinder it would be necessary to have both anterior and ocular surfaces toric and for each of these surfaces special tools would have to be made. In some cases of high myopia and low astigmatism with the axis of the cylinder horizontal a satisfactory result may be obtained by ordering the simple spherical from the table and giving them the appropriate tilt to correct the astigmatism. However if the ordinary prescription in high myopia be written with the cylindrical surface anterior a fairly good periscopic result will be often obtained, as good or better than can be obtained with one toric surface.

The optical results in simple myopia are excellent, but in high myopia it should be remembered that when looking downwards ranging movements and convergence of the eyes should be discouraged.

TABLE OF CONCAVE PERISCOPIC LENSES

Solid Angle of 60°. $\mu=1.523$

D	Distance		Distance 30 cm.	
	Ant. Surf.	Ocular Surf.	Ant. Surf.	Ocular Surf.
− 2	+ 5.73	− 7.75	+ 3.74	− 5.75
− 4	+ 4.74	− 8.75	+ 2.50	− 6.50
− 6	+ 3.74	− 9.75	+ 1.50	− 7.50
− 8	+ 2.75	− 10.75	+ 0.50	− 8.50
− 10	+ 2.00	− 12.00	− 0.50	− 9.50
− 12	+ 1.25	− 13.25	− 1.25	− 10.75
− 14	+ 0.75	− 14.75	− 2.00	− 12.00

AN IRIS-INCLUSION COMPLICATION

BY

LT.-COL. H. HERBERT, I.M.S.(retd.)

BRIGHTON

I HAVE to record a case of exceptional interest resembling sympathetic ophthalmitis, following an iris-inclusion operation for advanced chronic glaucoma.

Iritis set in ten days after the operation, and soon involved the other eye also. It persisted in both eyes for several months practically untreated, spreading to the ciliary body and the deeper layers of the cornea of the operated eye. But the case differed from traumatic sympathetic ophthalmitis in some important particulars:

1. Both eyes had repeatedly suffered from iritis before, as a complication of recurring subacute rheumatic fever.

2. The post-operative inflammation was evidently of exactly the same rheumatic type as the earlier attacks, though lasting considerably longer in both eyes, and being distinctly severer in the operated eye than ever before. There was a sudden onset with precisely the same pain as before, extending backwards with tenderness of the scalp, early ciliary congestion and some tendency to lacrymation. There was slight early turbidity of aqueous, with grey lines on the back of the cornea, and later, at one time there was considerable loose exudate in the anterior chamber of the operated eye, with coarse deep blood-vessels in the semi-opaque cornea. The course of events was quite different from that of recognized sympathetic disease, with its quiet gradual onset, slight subjective symptoms, keratic precipitates or early plastic exudate.

3. More important, there was an absolutely free period of ten days before the onset in the operated eye, emphasized by a very exceptionally wide dilatation of the pupil—a legacy of somewhat overfree use of cocain, adrenalin and atropin immediately before operation, but fully maintained afterwards by the routine single daily instillation of atropin.

I should like to emphasize the fact that this is a very different condition from that of low grade ectogenous infection. In the latter, though pain and congestion tend to be late in development, in my experience it is quite impossible to dilate the pupil at all fully, however early one attempts to do so after operation. One per cent. atropin drops used to the maximum from the first day after operation—nine or ten daily instillations—induce only partial mydriasis, and the pupil and coloboma, on careful examination with a loupe, fail to present a quite clean appearance from the beginning.

Supplementary details. The patient is a man, aged 68 years, with a history of repeated attacks of rheumatic fever during the last twenty years. The first attack lasted, with relapses, nine months; but it is said that there have been quite half a dozen more or less distinct periods of joint affection, evidently subacute. He has been invalided continuously through heart trouble. At first the eyes escaped, but since 1911 they are said to have been involved on each occasion as the joint affections were subsiding—always both eyes, but not both starting at the same, or becoming equally acutely inflamed at the same time. Finally in 1923, the eyes were attacked alone, without any joint disturbance. Thus there was apparently a steadily increasing tendency to localization in the eyes. The eye condition was treated on the first occasion at the Sussex County Hospital, afterwards by his panel doctor only, as the patient was practically confined to his house. Each attack of eye inflammation lasted possibly two months. The inflammation cannot have been very severe, since in one eye, the operated eye, I found no traces of it left. In the other, the right eye, there was a broad posterior iris-synechia and a pigment spot on the lens.

There is no evidence that the iritis had any influence in inducing the glaucoma. The latter had the features of pure chronic simple glaucoma of both eyes. The right eye had been quite blind for two and a half years. The left, upon which I operated, was also blind except for a characteristic small patch of vision in the outer field, where one or two fingers could be counted at a distance of about six inches. The irides were bright, and the media perfectly clear, allowing the deeply-cupped optic discs to be seen easily. The tension was + 2 in each eye, but gave way distinctly to eserin, under the use of which for a fortnight before operation the vision of the left eye improved slightly, to counting fingers at over one foot distance.

Supporting this assumption of the absence of any aetiological connection between the previous iritis and the glaucoma, the interesting fact may be noted that throughout the months of post-operative inflammation, the tension of *both* eyes was definitely subnormal.

The iris-inclusion operation was performed quite satisfactorily and uneventfully on July 4, 1925, at the Worthing Hospital. A week later the vision had fallen back to the original counting of fingers at six inches. There was a slight return of plus tension, probably connected with the extreme dilatation of pupil, above mentioned. Two days later eserin instillation was begun again on this account, and continued for five days, *i.e.*, until I saw the patient again. The vision was then reduced to hand movements only; the tension was down, and there was iritis. So atropin was again ordered, and the patient allowed to go home. I saw him again a week later, but after this he was in the hands of his panel doctor, there being practically no prospect of any recovery of vision. I lost touch with the case till November. Both eyes were then inflamed, the left showing the exudate and vascular cornea above mentioned. The patient had had no constitutional treatment. I suggested that salicylate should be given, as on all former occasions, but the suggestion was not accepted.

To exclude the bare possibility of a gonococcal origin of the case, Mr. F. H. Lawson, Medical Officer of the V.D. Clinic, Brighton, kindly visited the patient. He took specimens of prostatic secretion, urine and blood—one of the latter for gonococcal complement deviation test, and also, as a matter of routine, another for a Wassermann test. All the tests were negative.

The eyes remained slightly injected and watery, and the left one tender on pressure, until finally in February, 1926, "rheumatic medicine," presumably salicylate, was given. I saw the patient a month later, and found the operated eye at last perfectly quiet, and the tension felt normal. The cornea was opaque and the vision mere perception of light. In the other eye the tension was raised again definitely, with exclusion of the pupil.

Remarks. My personal interest in the case was enormously stimulated by the fact that this has been the only experience that had caused the slightest wavering in a slowly acquired belief that iris-inclusion must eventually become the chief operative treatment of at least the severer primary glaucomas. This faith predicates a reasoned confidence in the feasibility of total and certain exclusion of ectogenous infection. A single unexplained case of sympathetic ophthalmitis in my own practice would be sufficient to destroy the belief.

Recent experience has tended greatly to strengthen the conviction that true traumatic sympathetic disease represents an invasion of the exciting eye by external organisms. One may instance the almost complete elimination of the disease in the great war "by increased skill in the application of antiseptic principles . . . in spite of the fact that ophthalmic surgery has become more conservative."

My own feeling of security, as regards the prevention of ectogenous infection, is based primarily on cataract work in India, which attained dimensions sufficient to afford the needed sense of reliability. Both Colonel Elliot and I were able, with the help of measured perchloride irrigation of the conjunctiva, entirely to avoid primary suppurations, while greatly reducing lower grade infections, in our final periods of Indian work (see *Trans. Ophthal. Soc., U.K.*, 1914, pp. 46-8, 280-1).

From this degree of success in dealing with the large and often imperfectly covered wounds of cataract extraction, it is not unreasonable to expect complete success in the exclusion of surface organisms from the small subconjunctival wounds that suffice in glaucoma work. So far as I know, this expectation has been realized in all my iris-inclusion operations since measured irrigation was adopted for them (*Trans. Ophthal. Soc., U.K.*, 1903, p. 327). It would be strange, after so many years of freedom from ordinary septic invasions, now to get a quite unexplained instance of the less common sympathetic disease. More particularly does

this apply since the full two minutes' irrigation with 1 in 3,000 sublimate solution is now practically always employed.

For this reason, in addition to the three given on page 380, I conclude that the double complication here reported was endogenous—a recurrence of the old rheumatic inflammation, *excited and*, in the operated eye, *aggravated* in some way *by the operative interference*.

Analyzing the post-operative sequence of events, it was remarkable that the actual operation seemed to have troubled the eye very little, if at all. The sudden onset of iritis when eserin instillations were resumed nine days after the operation suggests that the sudden flooding of the blood-vessels of the iris, after a period of very marked compression by extreme dilatation of the pupil, may have set free, or rejuvenated, encysted organisms left in the iris from previous rheumatic attacks.

It may be noted that the drag upon the iris was quite localized in this case. The impaction was exceptionally small, since all of the iris except that normally situated quite close to the sclero-corneal wound was withdrawn from the wound by the very marked dilatation of the pupil. It is questionable whether the same result might not have happened from any operation leaving the iris unimpacted, as occurs in endogenous infection (of the operated eye) following cataract extraction.

The value of the case lies in the fact that while it establishes clearly an endogenous post-operative complication liable to be mistaken for true traumatic sympathetic disease, it also supplies distinctive features that may be of use in the recognition of other cases of the same nature, perhaps not so fully differentiated.

It will be interesting to note whether in all such cases the affection of the operated eye proves to be, as in this instance, severer than in the fellow eye.

The experience is altogether too exceptional to act as a deterrent in considering the treatment of glaucoma by iris-inclusion, except in the rare cases where there may be, as in this patient, a history of previous recurrent iritis. Rheumatic fever is only one of the rarer causes of iritis, and the vulnerability of this patient to the disease was evidently very exceptional; and it was a rare chance that the rheumatic inflammation happened to fall on eyes predisposed to glaucoma.

On a few occasions I have used irid-encleisis for plus tension left by former iritis or irido-cyclitis of common type. The operations were ineffectual, but there was no re-lighting of the old inflammation.

Operative Considerations. Until such endogenous complications are clearly recognizable, it is impossible to get a true perspective regarding treatment by iris-incarceration. Granted that true

sympathetic ophthalmitis is due to an external organism, it is not right that the fear of the disease should debar the patient from the promise of benefits held out apparently only by iris-incarceration. The advantages apparently realizable are uniformly permanent and yet moderate drainage, elimination of hypotony and of the conjunctival bleb, also of the dangers of a large incision and of delayed re-formation of the anterior chamber.

It is the surgeon's business to exclude all possibility of surface infection, and there is sufficient evidence that it can be done. Unless exceptionally reliable culture tests are available, some proved means of clearing away conjunctival bacteria should always be used. The only means with which I am personally acquainted is the maximal perchloride irrigation that has stood the test of a quarter of a century of practical experience in India. This, with swabbing of the lid margins by the same solution, causes a little conjunctival and lid swelling. Conjunctival injection is controlled during operation by adrenalin. There is a variable degree of smarting for a few hours afterwards, and there is often a little mucoid discharge later. But it never does any harm, and I have never found that the patients object to it. They infinitely prefer it to running the slightest risk.

Also the method of operating should be as subconjunctival as possible. I should like merely to mention a technique that promises particularly well. Dissatisfied with imperfect subconjunctival drainage in operating with the triangular keratome, I have lately gone back to the narrow tapering glaucoma knife. The sclero-corneal incision is made after sliding the conjunctiva. The only opening in the latter is vertical or oblique, 4-5 mm. long, in the upper outer quadrant of the eye, 4-5 mm. away from the cornea. And the subconjunctival drainage up to date appears perfect. But I have only done a few of these operations, and it is too early to speak of the final results.

AN INTERESTING EXAMPLE OF HEREDITARY DISLOCATION OF THE LENS OCCURRING IN FOUR SUCCESSIVE GENERATIONS

BY

ELIZABETH PACE CAMERON, M.B., Ch.B., D.P.H.

CARDIFF

THE following example of hereditary dislocation of the lens occurring in four successive generations, appears to be of sufficient interest to be worth recording. There have been fourteen persons affected of whom only one was a male. Five have had to be trained in institutions for the blind. In every case, both lenses have been

dislocated, the vision has been seriously affected and a squint, either convergent or divergent, has been apparent.

The family was brought to my notice when three sisters who attended my school refraction clinic were found to be suffering from subluxation of both lenses, the mother who accompanied them having the same defect. Their condition was briefly as follows:

(1) L.J. (female), aged 13 years, had vision R. 1/60; L. 1/60. Both lenses were partially dislocated upwards so that their crescentic edges lay across the centre of the pupils. Vision with +12.00D. sph. was R. 3/60; L. 3/60. No abnormality was detected in the fundus. The case was certified for a special school.

(2) E.C. (female), aged 11 years, had vision R. 3/60; L. 3/60 which was not improved by lenses. The dislocation was similar to the above and the fundi appeared normal. She also was sent to a school for the blind.

(3) H.V. (female), aged 6 years, could not read letters but her vision seemed to be R. fingers counted at 8 inches distance; L. 1/60. *The right lens was much displaced to the temporal side* leaving most of the pupil free, and therefore vision was improved *by a +11.00D. sph., and it was hoped that by wearing this lens the* child would develop considerably the function of the retina. In *the left eye, the lower margin of the lens was across the centre of* the pupil. The fundi were both normal.

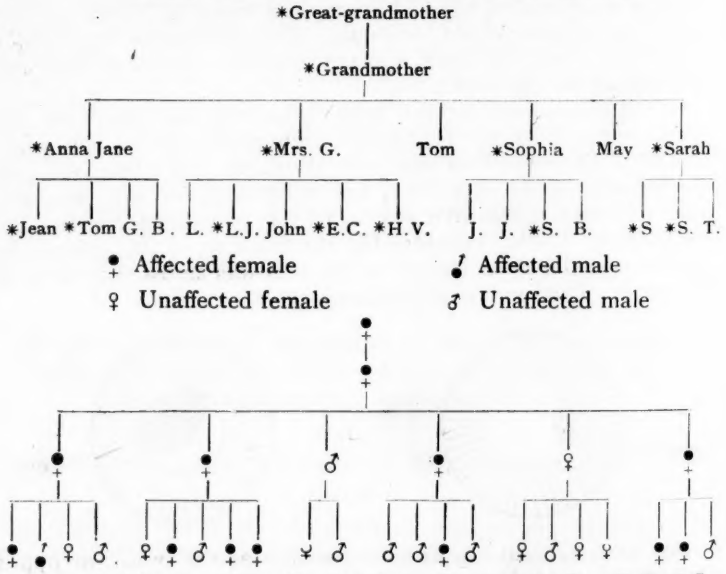
(4) Mrs. G. had dislocated lenses but as her pin-point pupils did not dilate under atropin it was impossible to make out the details. She had tremulous irides and vision R. 3/60; L. 3/60 which was improved by +11.00D. sph. to R. 5/60; L.5/60.

The family history was found to be interesting. The condition can be traced to the great-grandmother who was the only one of seven children to be affected. Her only child, the grandmother of my patients, inherited the defect and of her six children four are affected including Mrs. G. Mrs. G. has five children, the three reported above and two unaffected (one boy and one girl). Mrs. G.'s elder sister, Anna Jane, was trained in a "blind" institution, and of her four children, one girl and one boy are normal, while one girl and one boy are affected, and have been educated as "blind" (this is the only boy in the series). Mrs. G.'s brother, Tom, and sister, May, are unaffected, Tom's two children and May's four children being normal.

Sophia, a younger sister of Mrs. G., has dislocated lenses, but sees moderately well with strong convex glasses; her two boys by a first husband are normal, while a daughter by a second husband is affected; her baby boy has not shown signs of the defect. Sarah, the youngest of Mrs. G.'s sisters has inherited the condition, and of her three children, the two girls are victims while the boy has escaped.

The following diagrams illustrate the position:

* Means affected with subluxation of both lenses.



I am indebted to Mr. D. Leighton Davies, M.D., F.R.C.S., for seeing some of these cases and suggesting that they should be published.

PEDIGREE OF LAMELLAR CATARACT

BY

WAJID ALI KHAN

LONDON

MY thanks are due to Sir John Parsons and Mr. Holmes Spicer for permission to publish this pedigree.

On March 18, 1925, George G., aged 5 years, was brought to the Royal London Ophthalmic Hospital on account of defective vision and admitted under the care of Sir John Parsons. He was examined under a mydriatic when lamellar cataracts were diagnosed. On further inquiry it was found that his mother, her two brothers, and her mother had had cataract operations performed in Moorfields Eye Hospital. All the available members of the family were examined under a mydriatic.

Mr. G. (father of the above case) no eye trouble. Examination: corneae clear, irides bright and active. No lens opacities, fundi normal.

John G. (brother), no eye complaint, no lens opacities. Media and fundi normal.

Mary G. (sister), no symptoms, no lens opacities. Media and fundi normal.

The following notes have been taken from the in-patient records:

Thomas P. (maternal uncle), aged 10 years, admitted under care of Mr. Holmes Spicer, April 27, 1900, with a history of failure of sight since measles 18 months ago. Teeth fair and no history of fits.

Examination: R. and L. No mucocele, corneae clear, good anterior chambers. Irides bright, pupils active. Zonular opacities, peripheral red reflex.

April 27, 1900.—Left needling with subsequent curette evacuation.

January 23, 1901.—Right needling.

Annie P. (mother), aged 10 years, admitted under care of Mr. Holmes Spicer, July 11, 1902, with history of bad eyesight. Examination: R. and L. No injection, no mucocele, lids healthy, corneae and anterior chambers clear. Reactions normal. Lamellar cataracts.

July 12, 1902.—Left needling with subsequent curette evacuation.

September 19, 1902.—Right needling.

John P. (maternal uncle), aged 6 years, admitted under care of Mr. Holmes Spicer, November 9, 1909, with history of bad eyesight for twelve months. No history of convulsions. Teeth irregular. Examination: R. and L. External parts healthy, corneae bright, pupils active. Lamellar cataracts.

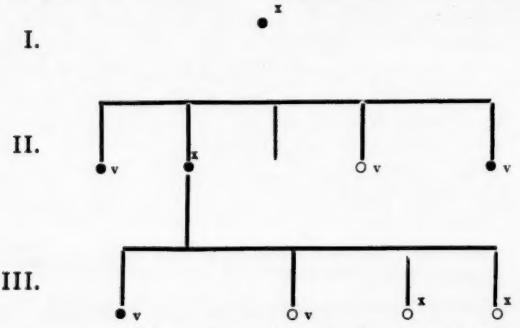
November 19, 1909.—Left needling.

November 23, 1910.—Right needling.

Annie Maria H. (grandmother), aged 14 years, admitted under care of Mr. Hulke, October 12, 1874. Examination: R. and L. Lamellar cataracts.

October 12, 1874.—Left needling. Patient did not come back on account of pain.

Normal. ○ v – male ○ x – female *Lamellar cataract* present ● v – male ● x – female



The occurrence of lamellar cataracts in several generations of a family is not very rare, and a number of pedigrees have been worked out[1]. These pedigrees do not fulfil all the requirements of the Mendelian theory, and this is not difficult to explain when one takes into consideration the fact that it is impossible to get data of all maternal conceptions; even the number of miscarriages is not easy to ascertain. According to this theory we should have one-quarter or one-half of the offspring affected with the disease in most cases, as shown by the following theoretical results:

DD = Dominant. RR = Recessive. DR = Hybrid.

	a	b	c
I.	DD × DD	DD × RR	DD × DR
II.	DD · DD	DR · DR	DD · DR

	d	e
I.	DR × DR	DR × RR
II.	DD · DR · DR · DR	DR · RR
	Common when disease is recessive. ¼ of offspring diseased.	Commonest form, disease either dominant or recessive. ½ of offspring in either case diseased.

There is much in heredity that has to be explained yet, and though the present pedigree does not fit in accurately with the above, it illustrates quite well the influence of heredity in lamellar cataract.

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ATYPICAL COLOBOMA OF THE IRIS

BY

WAJID ALI KHAN

LONDON

THE following case is of interest as it proves the inflammatory origin of at least some cases of atypical colobomata of the iris.

W.F., female, aged 21 years, out-patient, Royal London Ophthalmic Hospital. The sight of the left eye has always been defective; the mother noticed something wrong with the pupil of this eye at birth. There is no history of any injury or inflammation

of the eyes. Patient has three brothers, all have normal eyes. No history of any congenital defect in the parents.

Right eye normal, pupils active, V$\bar{c}$. $\frac{-3 \text{ D. sph.}}{-2.5 \text{ D.cyl. } 90°} = 6/6$.

Ophthalmoscopic examination shows a myopic fundus with well-marked temporal crescent. There is no other abnormality present.

In the left eye vision is less than 6/60, $\bar{c}$ correction 6/60. There is a coloboma of the iris outwards and slightly upwards reaching to the ciliary border. It involves one-eight of the whole circumference of the iris and becomes narrower towards the ciliary margin. The sphincter muscle is not prolonged along the edges of the coloboma. Left pupil reacts to light directly and consensually, and to accommodation. With the aid of the slit-lamp thin tags of tissue resembling iris in colour (deep brown) are seen projecting forwards and inwards from the ciliary margin; they occupy the defect in the iris. They are situated at a deeper level than the iris. A white streak is seen on the anterior surface of one of them. The outer half of the lens towards the colobomatous area is cataractous and of a woolly white appearance; situated at different levels in the anterior part of the cortex at this part of the lens are dots, deep brown in colour, of various sizes and shapes. There is a slight notch in the lens posterior to the colobomatous area. There is no visible coloboma of choroid or ciliary body, but of course, this part of the fundus is difficult to see on account of lens opacities. The suspensory ligament of the lens is not visible.

The fundus shows a typical picture of congenital syphilitic choroido-retinitis. There is irregular aggregation of pigment unlike what is seen in the right eye. The optic disc in this eye is atrophic with markedly contracted vessels.

Different theories have been put forward to explain the occurrence of atypical colobomata of the iris. In the present case it is highly probable that the coloboma of the iris and the small notch in the lens are both due to some inflammatory disturbance at that particular part of the ciliary body. This also explains the cataract which is due to nutritional disturbance of the developing lens, or defective development of the suspensory ligament at that part.

My thanks are due to Sir John Parsons for allowing me to report this case, and to Miss Ida C. Mann who kindly made the drawing.

FAMILIAL JUVENILE DEGENERATION OF THE MACULA

BY

J. S. STEYN, M.D.

JOHANNESBURG, SOUTH AFRICA

LATE CHIEF ASSISTANT, UNIVERSITY EYE CLINIC, GRONINGEN.

(DIRECTOR: PROF. DR. G. F. ROCHAT)

ABOUT a year ago I examined a few cases of familial degeneration of the macula, in the University Eye Clinic, Groningen. This infrequent and peculiar disease is described under different names. Leber[1] calls it "familiar-hereditäre Tapetoretinale Degeneration der Makulagegend," and C. Behr[2] "Heredodegeneration der Macula." Batten[3] described a form of cerebral degeneration associated with changes at the macula seen in several members of a childship.

The writer pointed out that though the clinical features and the ophthalmoscopic changes differ somewhat from those seen in the Waren Tay-Sachs disease, yet the pathological changes of the central nervous system, and the ganglion cells of the retina are so similar, that it seems probable that they are one and the same disease, but occurring at somewhat different periods of life. The children are born healthy and develop normally to a period of life varying with the different families. They begin to show, first, loss of intellectual faculties; then, loss of vision; and lastly, loss of motor power. The disease progresses slowly, eventually rendering the child blind, demented, and spastic. The disease is neither race nor sex selective. The changes at the macula consist of a diffuse pigmentation which extends more or less into the retina around. The disc is of a greyish-white colour, with vessels a little thinner than normal. I shall first describe the cases observed by me, and then compare them with the cases described by others.

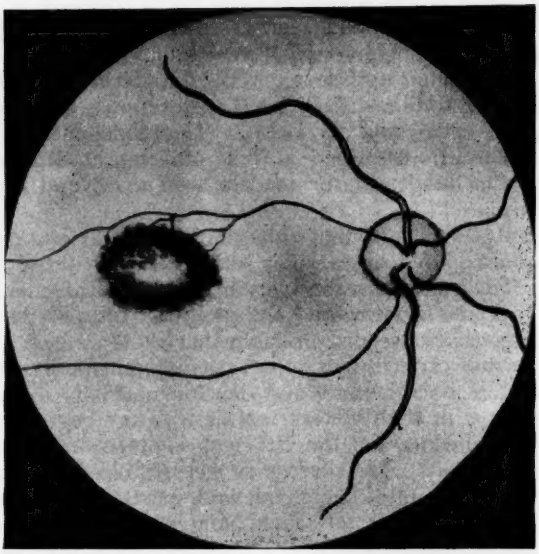
Case 1.—T.W., aged 28 years, carpenter, came to the clinic in the beginning of 1923 with the complaint that his sight had gradually failed during the last three years, and that he was not able to perform his work as well as before. Previous to that time he could see well and had never had any trouble with his eyes. Patient was well built and otherwise healthy. The intellect was quite good. Urine: no albumen or sugar. Wassermann in blood negative.

The vision of the right eye was 6/36, c +1,D. Sph. 6/36. Vision of the left eye was 6/24. $\bar{c}$ +1,5D. Sph. 6/24, so that, though the patient was hypermetropic, glasses gave no improvement.

A year later the vision was O.D. 3/24, $\bar{c}$+1,5D. Sph., 3/24 and O S. 3/18 partly, $\bar{c}$ +1,5D. Sph., 3/12. The fields of vision were

not contracted, but he had central scotomas for colours. The patient was not colour blind. The pupils were round and reacted well to light and convergence. The movements of the eyes were free in all directions. Examination of the anterior parts of the eyes revealed no changes.

The papillae were slightly on the pale side, but had well defined borders. The arteries were slightly thinner than normal.



At the macular region was a diffuse pigmentation forming an oval-shaped body, a little larger than the disc, with compact pigment on the border, more granular towards the centre, in which was a little white spot.

In the remaining parts of the fundus no abnormalities were found. The changes in the left eye were exactly like those of the right eye, except that the central white spot in the pigmented area was a little smaller than that of the right eye.

Case 2.—P.W., aged 21 years, carpenter (younger brother of T.W.), came to the clinic in 1922 with a foreign body on the cornea of the left eye. He further stated that he had seen little or nothing with the right eye for the last two years. Before that time he did not notice that his sight was bad. Patient was well built and healthy. Urine: no albumen or sugar. On examination

a foreign body was seen on the cornea of the left eye 2 or 3 mm. from the upper margin of the limbus with a slight infiltration round it. The pupillary region of the cornea was free. The vision of the eye was 6/12 partly, c +1D.Sph., 6/12. The foreign body was removed and a month later when the cornea was quite normal again the vision was still 6/12 and could not be improved.

The vision of the right eye was 4/60 and could not be improved with glasses, although the patient was found to be hypermetropic 3D. in the eye. The field of vision of the right eye was found to be slightly contracted, especially on the temporal side, and there was a central scotoma for colours.

Movements of the eye were free in all directions and the pupil reacted normally to light and convergence. Ophthalmoscopic examination revealed no changes in the anterior parts of the eye. The disc was slightly pale and the arteries rather thin. At the macula the same changes were found as described in the first case.

The family history of the two patients is as follows: The grandfather and grandmother on the father's side could see well; but the father and his only sister have very bad eyesight. My two patients have another brother and sister, the brother sees very badly, while the sister has normal eyesight. Unfortunately they could not be examined.

A third case of which I would like to give a short account is a girl, aged 13 years. She came to the clinic for the first time in 1921, when she was ten years of age, with the history that her sight had been gradually getting worse during the last three years. Before that time she could see well (I was informed by the parents). The vision of both eyes was then 5/60 and could not be improved with glasses.

The girl was otherwise physically quite normal. Urine: no albumen or sugar. Wassermann was negative. Since 1921 the vision has gradually got worse so that she has at present a vision of 1/300 of the right eye and 2/60 of the left eye. The anterior parts of the eyes were found to be quite normal. The papillae were rather pale and the vessels thin; while the maculae were diffusely pigmented with granular pigment, a small white spot being in the centre of the pigmented area.

It is thus seen that in the case of two brothers the disease started at the age of about 20 years, while in the case of the girl it started at the age of six to seven years; this is in accordance with C. Behr's description that in each family the disease has a typical time of appearance and course. It always affects the members of any one family at the same time of life, either at the age of six to eight years (Behr's infantile group) or at the age of 14 to 20 years (Behr's adult group) The disease is mostly either progressive, but never leads to total blindness unless there is a

simultaneous severe complication, as optic atrophy, or becomes stationary after some time, and sometimes improves.

According to Alkio, who described four cases of hereditary macular degeneration in one family, which cases correspond very much with mine, colour blindness was a very prominent symptom. This symptom was also observed in ten other cases by Best, Nettleship, Nagel, Uhthoff, Hess, Grunert, and Behr, *cit.* Alkio.

In my cases colour blindness was absent, but they all had central scotomas for colours. Leber places the pigment degeneration of the retina in one great group and subdivides it into:

(1) The typical retinitis pigmentosa.

(2) Special forms of pigment degeneration of the retina with its analogous diseases to which group belongs the familial tapeto-retinal degeneration of the macula and papillary region. Near to this group stands the Waren Tay-Sachs family amaurotic idiocy. Leber called it tapeto-retinal degeneration as the disease starts in the pigment epithelium (tapetum nigrum), and afterwards spreads to the other layers of the retina. K. Stargardt, however, divides the pigment degenerations of the retina into four groups:

(1) "*Die familiare präsenile*" macular degeneration (Tay) or choroiditis guttata.

(2) "*Die familiare honigwabenähnliche*" macular degeneration (Doyne).

(3) "*Die familiare angeborene*" macular degeneration (Best).

(4) "*Die familiare progressive*" macular degeneration (*a*) with and (*b*) without psychical disturbances.

The cases described by me fall under group four of Stargardt, while the first two cases fall under (1) and the last one under (2); because the two brothers T.W. and P.W. were quite sound in mind while the young girl manifested symptoms of dementia. She walked about in her sleep and would sometimes laugh for quite half an hour without any apparent cause, which is certainly striking in a girl who is almost blind. She sometimes stood on her head in bed, climbed on the cupboards in the ward and did other things suggestive of idiocy.

This young girl in whom the disease started at the age of seven comes under Behr's infantile group, while the two brothers, where the disease started at the age of twenty years, fall under his adult group. We further notice that the disease progresses very slowly in the case of the brothers where it started at the age of twenty, while in the case of the girl where it started at seven, it had a very rapid course, as she is almost blind at the age of 13 years. This

is in agreement with Batten's statement that the later in life the disease appears, the less acute the course seems to be, and in those cases in which the visual defect manifests itself during or after the second decade of life, there appears to be little or no liability for the central nervous system to be affected.

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ANNOTATION

Pedigrees

It was Juvenal, so far as we know, who first threw cold water upon genealogy. *Stemmata quid faciunt*: of what use are pedigrees? He was speaking of the absurdity of trying to derive all and sundry from noble blood; and in this connection it is worth while reminding our readers that one of the greatest genealogists of all time has written on this subject as follows:*

"It is not always that the generations of a family, of mere knightly degree, can be traced with certainty up to the beginning of the thirteenth century. The latter half of the twelfth century is, in similar investigations, a limit not often surpassed with probable truth, whilst its earlier half is only a field for the wildest conjecture."

In dealing with the genealogy of disease, we must remember that it is very unusual to find more than four generations in any family, alive at the same time. We do not think that it would be possible for a surgeon to examine more than four generations of any family with regard to the eyes. In this matter of pedigrees of disease we are building for our successors; and so long as no attempt is made to trace eye disease in families back to mediaeval times, the pedigrees which are now being drawn up and carefully recorded, such as those published in this number and those recorded in the monograph on colour blindness, will be of the greatest value in years to come.

*EYTON. Antiquities of Shropshire, Vol. 1, p. 99.

COUNCIL OF BRITISH OPHTHALMOLOGISTS

Annual Report

THE Council of British Ophthalmologists presents its report for the session 1925-26.

At the first meeting of the session the following officers were elected:—President: Mr. E. Treacher Collins; Vice-Presidents: Sir George Berry, M.P. and Mr. J. Herbert Fisher; Hon. Treasurer: Mr. J. Herbert Fisher; Hon. Secretary: Mr. W. H. McMullen.

The following members were elected to serve on the Executive Committee: Sir John Parsons, Mr. J. Herbert Fisher, Mr. M. S. Mayou, and Mr. F. A. Juler, with the President and the Hon. Secretary *ex-officiis*.

The scheme for provision of ophthalmic benefit by approved societies, which was agreed to last year by the Ministry of Health after negotiations in which the Council took an important part, has now been adopted by many of the approved societies. The Council has appointed a sub-committee to collect information with regard to the working of the scheme, especially in respect of the attendance at hospitals of patients entitled to ophthalmic benefit. It is pleased to note that the Royal Commission on National Health Insurance, before which the Council gave evidence last year, in its recently published report recommends that ophthalmic benefit should be recognized "as part of the expert out-patient service under the scheme of extended medical benefit, and should not be available except on the recommendation of a medical practitioner."

The Council has published a report on the methods adopted in various parts of the British Isles for the education of children suffering from defective vision due to myopia and other causes (excluding the blind). The report has been sent to the President of the Board of Education, to the Minister of Health, to all local education authorities in Great Britain and Northern Ireland, to medical and educational periodicals, and to the principal London and Provincial papers. It has received favourable notice in many quarters, being reprinted in full in the *Lancet* and the *School Government Chronicle*, and forming the subject of editorial notices in all the leading medical and educational periodicals. Paragraphs referring to it appeared also in many of the London and Provincial daily papers. A question was addressed to the President of the Board of Education in the House of Commons by Sir George Berry, asking if his attention had been drawn to the report and whether he proposed to take action with regard to the recommendations contained therein. The Minister replied that he had seen

the report, that provision had already been made in various parts of the country for the education of partially blind children on the general lines recommended in the report, and he hoped that this provision would be extended as circumstances permitted.

Drafts of a Bill have been issued by the "Joint Council of Qualified Opticians" "to secure the registration of optical practitioners and to regulate the practice of sight-testing and optical dispensing and for purposes incidental thereto." The Council has written to the General Medical Council and to the medical members of Parliament calling attention to the proposed Bill and pointing out objections to it.

A Committee has been appointed "to inquire how far the recommendations of the Departmental Committee on the Causes and Prevention of Blindness with reference to ophthalmia neonatorum have been put into practice, and to advise the Council as to any action it might be advisable to take."

Committees on the standardization of test-types and on industrial diseases and accidents are continuing their investigations.

Arrangements have been made with the National Committee for the Prevention of Blindness in the United States of America and the Eyesight Conservation Council of America to exchange reports with those of the Council.

The expenses of the Council have been defrayed, as in former years, by its members.

The Council desires to thank the Council of the Royal Society of Medicine for the use of rooms for meetings.

THE ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

At London, April 29, 30, and May 1, 1926

THE 13th Annual Congress of the Ophthalmological Society was held at the Royal Society of Medicine, under the presidency of Sir John Parsons. The usual programme was adhered to. The greater part of the proceedings consisted in the reading of papers; the clinical meeting for the demonstration of cases was at St. Bartholomew's Hospital; the annual dinner was held at the Langham Hotel; and the meeting concluded with a visit to the National Physical Laboratory at Teddington, where, by the kindness of the Director, Sir Joseph Patavel, the apparatus and nature of the important physical and engineering researches conducted by the Laboratory, were demonstrated to members of the Congress.

At the Royal Society of Medicine a Scientific Museum had been arranged, and a Trades Exhibition was run concurrently with the Congress.

Presidential Address

In his Presidential Address Sir John Parsons dwelt on the danger of over-specialization and advanced a plea to foster research on a wider basis, to keep abreast of the times, and to broaden the scope of ophthalmology and the activities of the Society whose function was to represent all that was best in ophthalmology in this country. While the growth of knowledge in the various departments of science had made specialization inevitable, it was of paramount importance to avoid the evils which this process tended to bring in its train. In this endeavour an ophthalmological society should play a leading part. The main functions of the practising ophthalmologist must always form the nucleus of its work, but it should at the same time take note of the ways in which ophthalmology impinged upon public life, and advances in other branches of science upon its own special domain.

Ophthalmology as a branch of medicine must scientifically be regarded as a branch of biology; and, inasmuch as biological processes depended fundamentally upon physico-chemical processes, progress in ophthalmology must depend primarily upon the application of new discoveries in bio-physics and bio-chemistry. Even as a branch of medicine, ophthalmology should not be confined to a narrow and delimited field. As a receptor organ the functions of the eye in the animal economy could not be grasped unless studied as an integral part of the vast and varied receptor apparatus upon which the whole conscious and unconscious life of the animal was built up. But although based upon the exact sciences, ophthalmology, in common with all biological knowledge, did not lend itself to accurate reasoning on the basis of generally accepted hypotheses, owing to the number and incontrollability of its variables. The desire to reach a pragmatic conclusion was often irresistible, and hence, in impatience at the slow progress of scientific investigation, the practitioner, and more so the public, were liable to catch at any straw, and succumb to the quack and the charlatan. To safeguard against this was a function of no small importance of the Society.

While the bane of specialization was isolation, the cure was co-operation. Not only must the ophthalmologist associate himself with the physiologist, and with those engaged in the field of general medicine, but he should also co-operate with those physicists who were devoting their lives to optical investigations, and moreover maintain a sympathetic and active interest in the work of those public bodies whose activities were directed to the

physical welfare of the community, much of whose labours deal with vision and cognate problems.

The scientific proceedings of the Congress will be published in full in the "Transactions" of the Society. They comprize two discussions and twelve papers, a resumé of which is published here.

A discussion on "Intra- and Extra-ocular Melanomata" was opened by Mr. W. G. Spencer, who discussed the origin of melanin pigment in the animal kingdom generally, and in the eye particularly. Its origin, he maintained, was in the epidermal cells only; mesoblastic cells, while they might be pigment carriers, were never pigment producers. The characteristics of malignancy in melanomata were discussed—the increase in melanin and melanogen, in karyokinetic activity, the presence of a surrounding inflammatory reaction and of extra-cellular pigment, and the replacement of the typical epithelial structure by cells showing a sarcomatous appearance. Dr. A. Whitfield dealt particularly with these growths as they appeared in the skin, and with his own original work upon them. In these neoplasms the pigment was not essential; the primary change was a catalytic process whereby the epithelial cells became isolated (stage of solution), and broke away to invade the sub-epidermal structures in well-defined groups (stage of germation). Mr. Treacher Collins arguing from the development and distribution of the pigmented structures in the eye, believed that melanin was a product both of epiblastic and mesoblastic cells. He described the various forms of melanomata as they occur in the different parts of the eye. Mr. R. A. Greeves showed a series of microphotographs of intraocular melanomata; and pointed out that in their clinical behaviour, those of the choroid and ciliary body did not correspond to that of typical epithelial neoplasms as did those of the conjunctiva. Mr. Foster Moore dealt mainly with innocent pigmented growths of the choroid—a largely neglected type of tumour. Mr. Richardson Cross described an interesting case of pigmentation of the caruncle, which after radical removal, recurred as an orbital sarcoma; and Mr. Davenport presented a family history wherein malignant melanotic growths occurred in the eye throughout four generations.

A discussion on "Birth Injuries of the Eye" was opened by Dr. Comyns Berkeley, who drew attention to their common occurrence despite their neglect by textbooks. The commonest forms were enumerated, ranging in severity from congestion of the lids to luxation of the eyeball, and their causes dealt with—in large part injury by forceps, either directly or indirectly through injury to the skull, or as a result of the congestion and oedema following labour. Mr. Ernest Thomson enumerated from his own

experience and jointly with Mr. Leslie Buchanan in their work published between 1902 and 1907, and from the literature, the various kinds of direct injury which may be incurred, and suggested that many more might be added to that list—such conditions as congenital nystagmus, squint, unilateral myopia, retinal detachment, holes at the macula, etc. Mr. L. Buchanan dealt with the effects of indirect birth traumata, and suggested that those obscure cases of mentally defective children with defective eyesight might find their explanation thus, largely through intracranial haemorrhage. Mr. Juler spoke particularly of the frequency with which retinal haemorrhages are seen especially if examination is made within the first twenty-four hours of life. These were at the posterior pole, were typically sub-hyaloid, and did not seem to depend on the difficulty or duration of labour. As a factor in their aetiology he suggested direct venous back-pressure from the cavernous sinus, their incidence being determined by the lack of anastomosing channels in these veins. Mr. J. Rowan drew attention to corneal injuries, particularly those which resulted in irregular astigmatic errors of refraction with opaque bands in the substance of the cornea; and Mr. Ballantyne and Mr. Harrison Butler further elaborated these, pointing out the frequency in them of detachments of Descemet's membrane.

The papers read may be briefly summarized thus:

Professor H. E. Roaf: "Some Observations on Colour Vision." The observations described were carried out by Ishihara's tests and the matching of two spectra with suitable corrections for luminosity. The defect in colour blindness was not a lack in the sensitivity to certain stimuli, but a failure in interpretation and appreciation; and its explanation was to be sought largely in the receptor mechanism. The subject was approached mainly from the bio-chemical aspect. Although the demonstration of its anatomical basis in man was lacking, the most attractive hypothesis whereon to explain colour vision and its defects was a physico-chemical one, depending upon the selective absorption of wave-lengths by a preferential filter—some such receptor mechanism as would correspond to the coloured globules found in the cones of birds.

Mr. Rayner Batten in a paper "On the Value of Collective Drawings of Diseases of the Fundus" spoke of the waste in the scattered wealth of insufficiently annotated drawings; by co-ordinated action much valuable material for systematized research would be gathered, and light thrown upon the varying features and progressive changes in many imperfectly understood conditions. An illustrative series of hyaloid-like structures in connection with patches of choroiditis was shown.

Mr. G. Young described a case of "Recovery of Vision that was Reduced to Hand-Movements by Chronic Glaucoma." The patient, a female, aged 71 years, had V.A. reduced to: right, hand-movements; left 6/36, with chronic glaucoma of very long standing. After treatment with pilocarpin for twelve months R.V.—6/12; L.V.—6/9; and the state of the fields, the light sense, and other symptoms cleared up correspondingly.

Mr. G. F. Alexander: "The Orientation in Lateral Diplopia." Starting from the observation that, on covering one eye with a red glass and observing a light, digital rotation of the covered eye invokes a homonymous movement of the red light alone, while similar rotation of the uncovered eye invokes a similar movement of both lights, the following are deducible: when from binocular vision of a distant object one eye alone rotates in to fix a near object in the visual axis of the other, we have single vision for objects in the horopter, homonymous diplopia for objects without it, and crossed diplopia for objects within it. The angle of strabismus is equal to the sum of the rotations of the subjective fields. In alternating strabismus with equality of vision in the two eyes, the subjective orientation is similar to that in physiological diplopia, the two images of a distant object in the central sagittal line being displaced homonymously from this line through half the angle of the strabismus. In uniocular strabismus with loss of acuity of vision in the deviating eye, the subjective orientation tends to become that of the constantly fixing eye.

Mr. Tomlinson added to his previous work on the subject of the "Comparative Brightness Value of the two Eyes and a single Eye" the observation that the two eyes possess an advantage in brightness value over one eye of about 1/7, the average ratio being 115:100. The two impressions received by the eyes are therefore integrated, not summated.

Mr. C. Goulden: "On the Value of Ultra-Violet Light Treatment in Certain Eye Diseases." Details of cases taken from a large number of patients treated by ultra-violet radiation were given. The conclusion reached was that many of the results were remarkably good; in the treatment of tuberculous affections of the eye particularly, and in phlyctenular lesions, especially in the younger patients, the new method of therapy was showing great promise. Mr. Duke-Elder, in a second paper, detailed the technique used in general phototherapy at Moorfields, and corroborated Mr. Goulden's results. He further dealt with the methods and clinical applications of local phototherapy, the radiations being applied directly to the eye and its adnexa in diseases of the lids, conjunctiva, and cornea. Dr. Donovan spoke of the technical details of treatment as followed at the London Hospital.

Mr. M. S. Mayou: "Siderosis Bulbi." From experimental and clinical studies the distribution and spread of iron in the siderotic eye was traced. Diffusion took place in the colloidal state, and was influenced largely by the mobility or comparative immobility of the medium (*i.e.*, aqueous compared with vitreous).

Mr. R. Davenport: "Senile Macular Exudative Retinitis." A series of 17 cases was presented by which this clinical entity, as yet not generally recognized, was illustrated. The pathognomonic characteristics included bilateral changes at the macula of exudative or haemorrhagic origin, more advanced in one eye in which the appearance almost resembled a tumour, accompanied by a central scotoma and metamorphopsia with the retention of peripheral vision, of very chronic development, occurring in old, but otherwise generally healthy people who were not constantly the subjects of an arteriosclerotic diathesis.

Miss M. Dobson showed a series of illustrations of "Diseases of the Macular Region as seen by "Red-Free" Light."

Mr. A. F. MacCallan and Miss I. C. Mann described a case of "Optic Neuritis in a Pedigree Bull." The bull showed in life swelling of the discs and blurring of their edges, accompanied by immobility of the pupil and blindness. The swelling was due to congestion and oedema, and the outer layers of the retina showed chronic degenerative changes probably haematogenous in origin suggestive of disseminated chorio-retinitis: there was partial depigmentation of the pigment epithelium of the retina, and in places the destructive changes spread to the rods and cones and the bipolar cells, all these layers being welded together with the choroid into a mass of deeply pigmented scar tissue.

Mr. E. F. Fincham demonstrated his model of the slit-lamp and corneal microscope, with its principle of automatic adjustment between the beam and the microscope. He further showed a series of excellent microphotographs demonstarting the structure of the retina in man, and photographs and diagrams showing a change in the shape of the lens during accommodation.

At the annual general meeting the election of the following officers was proposed and adopted:—President: Sir J. H. Parsons; Vice-Presidents: Mr. L. Paton, Lt.-Col. H. Herbert, Mr. E. Brewerton, and Mr. C. H. Usher; Treasurer: Sir A. Lawson; Secretaries: Mr. C. Goulden and Mr. H. P. Gibb; Members of Council: Mr. J. F. Cunningham, Mr. J. Wharton, Mr. F. P. S. Creswell, Mr. R. Foster Moore, Mr. R. A. Greeves, and Mr. M. L. Hine.

W. S. DUKE-ELDER.

ABSTRACTS

I.—GLAUCOMA

(1) **Wegner, W.—Can the formation of scotoma be produced by increased intraocular pressure alone? (Kann Skotombildung allein durch Erhöhung des intraocularen Druckes bedingt sein?.)** *Zeitschr. f. Augenheilk.*, Vol. LVI, Pt. i, pp. 48-53, July, 1925.

(1) Noting the fact that an increase and decrease in the size of scotomata frequently occurs simultaneously with a parallel variation in the height of the intraocular tension, **Wegner** asks himself the question: can the formation of scotomata be correlated with an increase of intraocular pressure alone? An experimental inquiry has led him to answer the query in the negative.

In a series of normal individuals the intraocular tension was taken and varied by Bleidung's apparatus (*Arch. f. Augenheilk.*, XCIV, p. 198, 1924), in which, after the principle of the sphygmomanometer, the eye is enclosed by a circular air-cushion applied to the orbital margin connected to a bellows and a manometer, in the centre of which cushion is a pane of glass through which either the patient or the experimenter may look. The tension of the eye may thus be raised to, and maintained at 100 mm. Hg. Scotomata and blind spots were charted by perimetry. In normal individuals, he finds that even after maintaining the tension at 30-40 mm. Hg. for half an hour, the size of the blind spot is unchanged, or increased to an extent so small as to be negligible. On the other hand, after subconjunctival injections of sodium chloride, whereby the ocular tension is only raised by 8-10 mm. Hg., a very definite enlargement occurs, which is apparent 10-20 mins. after.

A second series of experiments deals with a series of five cases of simple glaucoma, which were subjected to the same procedure. The first two had normal fields, the third had a vertically enlarged blind spot, and the fourth an enlarged blind spot with a ring scotoma; in all these four the tension was about normal; in none of them did the raising of the ocular tension induce any change either in the field, or in the blind spot, or in the scotoma. The fifth had a higher tension which could readily be raised or lowered by the exhibition of miotics or mydriatics; in this case the raising of the tension induced a corresponding change in the size of the scotoma.

From his investigations Wegner concludes that the formation or variation of the size of scotomata does not depend on a raising of the ocular tension alone, but that other complicating factors enter

into the case. The first four cases of glaucomatous subjects he considers in a stable phase of the disease, and these, as in the case of normal subjects, do not react; the last is in a labile phase, and in this condition factors such as retinal oedema and transudation play the determining rôle in the phenomenon, a condition induced also by the subconjunctival injection of salt.

His findings thus agree with those of Samojloff (*Klin. Monatsbl. f. Augenheilk.*, LXIX, p. 59, 1922; LXX, p. 655, 1923), and can be correlated with the clinical reports of: Rönne (*Klin. Monatsbl. f. Augenheilk.*, XLVII, p. 12, 1909), Löhlein (*Arch. f. Augenheilk.*, LXXVI, p. 165, 1914), Seidel (*Arch. f. Ophthal.*, LXXXVIII, p. 102, 1914), v. Szily (*Klin. Monatsbl. f. Augenheilk.*, LI, p. 196, 1913).

W. S. DUKE-ELDER.

(2) **Goslich, H. A.—A method of treatment preparatory to operation for glaucoma. (Über vorbereitende Massnahmen von Glaukom-operationen.)** *Zeitschr. f. Augenheilk.*, Vol. LVI, Pt. i, 1925.

(2) **Goslich** gives the results of the treatment of 19 cases of glaucoma by osmotic therapy, undertaken as a means of reducing the intraocular pressure prior to operation. In some cases sodium chloride was administered by the mouth in doses of 25 grams dissolved in a draught of 200 c.c. water, which the patient was persuaded to drink within a period of from one-quarter to three-quarters of an hour; in others an intravenous injection of 130 to 200 c.c. of a 10 per cent. solution was given; in most cases operation was performed one to one and a half hours later.

An analysis of his results shows: *Chronic Glaucoma*: 8 cases, of which seven received salt by the mouth, and one intravenously. All responded with a lowering of tension, in the most marked case of 21 mm. Hg., in the least of 7 mm. (This last eye had an initial tension of only 25 mm., which was thus reduced to 18.) *Glaucoma Simplex*: 2 cases, salt by the mouth. In one a fall in tension of 16 mm.; in the other no reaction. *Subacute Glaucoma*: 2 cases, by the mouth. In one a fall of 30 mm. in the other of 17 mm. *Acute Glaucoma*: 2 cases. In one, after an iridectomy the tension was still about 44 mm.; salt by the mouth induced a fall to 38 mm. In the other, an acute attack came on ten days after a trephine operation; intravenous salt had no effect. *Glaucoma Complicata (Iritis)*: 2 cases. In one, salt by the mouth: fall of 18 mm. In the other, intravenous salt; fall of 20 mm. *Haemorrhagic Glaucoma*: 2 cases. In one, intravenous salt; no effect. In the other salt by the mouth; fall of 9 mm. *Secondary Glaucoma*: 2 cases. One, traumatic subluxation of the lens; intravenous salt; tension fell from 78 to 18 mm. Schiötz, and remained so for ten days when it rose again;

injection repeated; similar result; second exacerbation; reduced again by injection; operation. The second, contusion with rupture of iris; intravenous salt; tension, 44 to 36.

Goslich expresses himself as satisfied with the results, and concludes that the method forms a valuable addition to the therapy of glaucoma, especially as an antecedent to operation. He recommends intravenous administration in youthful patients, and oral administration in the aged. [The importance of Goslich's paper lies in the fact that sufficient clinical experience in this method of therapy in glaucoma has not yet been gained to enable an exact estimate of its value in different types of the disease to be made. It is to be noted that he got more satisfactory results in chronic cases than in acute—an experience opposite to that of Weekers (*Arch. d'Ophtal.* XL). Goslich used large quantities of a comparatively dilute solution (10 per cent.), wherein the quantity of water introduced tends to defeat the object of the treatment; Weekers used a very small quantity (5 c.c.) of a concentrated solution. With the technique recommended by the reviewer (*Brit. Jl. of Ophthal.*, p. 30, 1926), an as yet small experience has suggested that both types of the disease may similarly be influenced, while at the same time keeping within the limits of safety.]

W. S. DUKE-ELDER.

(3) **Schoenberg, Dr. Mark J.—The Knapp adrenalin mydriasis reaction in direct descendants of patients with primary glaucoma.** *Arch. of Ophthal.*, May, 1925.

(3) Arnold Knapp published his article on the adrenalin mydriasis reaction in the *Archives of Ophthalmology*, November, 1921. There is no doubt that the test is positive in a large majority of glaucoma patients, and that susceptibility to adrenalin may be present long before the clinical signs of glaucoma. **Schoenberg**, having been impressed with the hereditary factor in this disease, decided to test the descendants of glaucoma patients with adrenalin. The test is performed as follows: After taking the tension with a Schiötz tonometer, and measuring the size of the pupil, one drop of fresh adrenalin solution 1 in 1,000 is instilled every few minutes for five times. After half an hour, the measurements of the pupil and of the ocular tension are again taken. Schoenberg found it advisable to use holocain before putting in the adrenalin. His paper gives the results in the 35 sons and daughters of 13 patients, with primary glaucoma. The descendants who were examined were all free from clinical signs of the disease but 50 per cent. of them were positive to adrenalin, 20 per cent. being strongly positive. He does not regard this observation as necessarily proving that the positive cases will develop glaucoma, and concludes by saying that his paper merely establishes a fact, the

interpretation of which will have to be postponed until more experience and study concerning this problem are available.

F. A. WILLIAMSON-NOBLE.

(4) **Curran, Dr. J. (Kansas City).—Subconjunctival cauterization of the sclera over the ciliary body with the galvano-cautery to reduce intraocular pressure in advanced glaucoma. Preliminary report.** *Arch. of Ophthal.*, July, 1925.

(4) Curran has so far tried this operation only as a last resort in cases of advanced glaucoma and has not yet had sufficient time to estimate its value. He evolved it as a result of seeing a case where there was deep cupping of the disc and obvious signs of old glaucoma. The intraocular pressure when the patient was seen was only 3 mm. above normal, and there was a large ciliary staphyloma due to an old gumma. Curran was led to believe that this staphyloma had acted in the same way as a decompression acts in the skull and cast about for some means of artificially producing such a lesion. He tried cauterizing various parts of the eyeball with no success until he attempted it in the ciliary region. Here he found that although no staphyloma was produced—at least in the beginning—the tension fell markedly in each case, sometimes permanently, sometimes temporarily. He attributes the result to the heat conducted to the ciliary body, putting it out of function and thus bringing about a diminution in the amount of aqueous formed. Atrophy of the iris has already been recorded in cases where thermophore treatment has been applied to the cornea. Technique of the operation:

The eye is cocainized and a subconjunctival injection is made in the area selected for operation. The incision is 15 - 20 mm. long, and a flap of conjunctiva is dissected up to the limbus without splitting the cornea. The sclera is exposed, and an area 6-8 mm. antero-posteriorly by 10 mm. laterally is cauterized. The lower edge of this area should be 2 mm. from the corneal margin. The cautery wire should be 1.5 mm. thick; it is heated to a dull red, and allowed to cool. As soon as it becomes black it is made to touch the sclera and to remain there for ten seconds. This is repeated until the whole area has been gone over. The sclera is therefore not perforated but it is charred, and no attempt should be made to remove the charred tissue. The conjunctiva is sutured back into position and a reduction in tension becomes apparent in about twenty-four hours. The paper concludes with an account of the results of 12 cases (16 eyes) all under high pressure for a long time, and with little or no vision. In five eyes the results appear to be permanent, with filtration through a spongy area over the place of cauterization. In seven cases there was a fall of pressure for seven weeks with a tendency to rise again. In one

case perforation occurred and a sudden loss of aqueous with intraocular haemorrhage. In two cases there was no improvement. In the last case there was a small staphyloma formed, and the intraocular pressure kept down for three months, after which it rose again.

F. A. WILLIAMSON-NOBLE.

(5) **Larsen, Harald (Copenhagen).—On the treatment of iridocyclitis glaucomatosa. (Ueber die Behandlung der Iridocyclitis glaucomatosa.)** *Arch. f. Ophthal.*, Vol. CXV, 1924.

(5) **Larsen** collected and analyzed a number of cases of iridocyclitis with secondary glaucoma for the purpose of comparing the relative value of treatment with mydriatics and miotics, and he found that better results are obtained with the former, because by means of them the tension can be reduced to normal more frequently and more rapidly, and the inflammation dies down better through immobilization of the iris and ciliary body: with mydriatics, too, there is less risk of relapses of inflammation. It should also be remembered that the tension not infrequently rises after the use of miotics while this rarely occurs with mydriatics.

The reason for the former preference for miotics arose from the fear that atropin would have the same disastrous effect as it has in primary glaucoma. The rise of tension in irido-cyclitis, however, is in the author's view due not to blockage at the iris angle but to hypersecretion of aqueous; hence the value of atropin in reducing the tension by its immobilization of the inflamed iris and ciliary body and check on the secretion of aqueous. Watch therefore should be made on the tension not with the object of substituting a miotic for the atropin but of using the latter more energetically.

In every case of irido-cyclitis Larsen recommends the energetic use of atropin in order to procure complete immobilization of the iris and ciliary body. If in spite of this the tension rises the atropin should be used still more freely and if it fails one must have recourse to operation—trephining he considers the best procedure—followed by continued use of the mydriatic in order to get control of the inflammation before filtration through the operation fistula ceases.

THOS. SNOWBALL.

(6) **Zavalía, A. U.—Primary ocular hypertension as an initial manifestation of Zoster Ophthalmicus. (Hipertension ocular primitiva como manifestación inicial del Zona Oftalmico.)** *Arch. de Oftal., Hisp.-Amer.*, Vol. XXVI, p. 157, March, 1926.

(6) **Zavalía** describes two cases wherein an attack of raised tension preceded the onset of a typical attack of herpes by some days. A review of the literature brings out the following points connected with the coincidence.

Herpes may be associated with either a raising or a lowering of the tension of the eye.

The hypotonia occurs under the following conditions:

1. As a consequence of an iritis or cyclitis accompanying the lesion.

2. Without irido-cyclitis, probably to be associated with a paretic lesion of the sympathetic.

There are two distinct conditions of hypertony corresponding in their aetiology to the above: a primary one, due to an irritative sympathetic condition, and a secondary one, following an associated irido-cyclitis. Usually the hypertension comes on during the course of the disease, very rarely it is a prodromal symptom.

The course and the prognosis of this herpetic hypertension varies with the condition of the eye: if this is normal, miotics readily control the tension, recovery is rapid, and the prognosis is good; if, however, the eye is glaucomatous or predisposed thereto, there invariably develops a typical acute or subacute attack of glaucoma, requiring radical surgical measures to preserve vision. In the development of a sudden attack of hypertension the possibility of herpes should never be lost sight of, especially when a unilateral headache persists after the tension has been got under control. Conversely the tension should be carefully watched in those cases of this disease where atropin is being used.

W. S. DUKE-ELDER.

II.—MISCELLANEOUS

(1) **Gjessing, H. G. A. (Norway).—Is there an antagonism between senile cataract and Haab's senile degeneration of the macula? (Gibt es einen Antagonismus zwischen Cataracta senilis und Haabscher seniler Makulaveränderung?)** *Zeitschr. f. Augenheilk.*, Vol. LVI, Pt. 2, pp. 79-90, August, 1925.

(1) **Gjessing** has made a study of the incidence of senile cataract and Haab's senile degeneration of the macula, which is of considerable theoretical interest in view of the theory put forward by van der Hoeve on the influence of the abiotic action of light in the aetiology of these two diseases (*Arch. f. Ophthal.*, Vol. XCVIII, pp. 1-6, and 40-60).

The essential feature of van der Hoeve's theory is that the lens is optically heterogeneous, that light falling upon it is partially dispersed and partially passed on to the retina, that a large moiety of the dispersed light is thrown on to the ciliary body and there,

largely through a heating effect (Parsons), influences adversely the production of aqueous, which in turn induces lenticular degeneration. The more heterogeneous the lens is, the more light is dispersed, the greater the effect on the ciliary body, and the more likelihood of cataract formation: the more optically homogeneous the lens is, the more light passes undisturbed to the retina, and the more likelihood of the development of macular degeneration. The two diseases are therefore both due to the abiotic action of light, and they tend to be mutually exclusive—a heterogeneous lens exposing itself and protecting the retina, a homogeneous lens protecting itself and exposing the retina.

Setting out to determine whether or no this relation obtains statistically between the two abiotrophies, Gjessing has examined 2,259 cases, involving 4,381 eyes, between the ages of 55 and 97. With deductions for other pathological conditions whose occurrence would interfere with the unbiassed consideration of the problem, he makes use of 2,014 individuals, involving 4,015 eyes. He finds that cataract as an isolated condition is most common in the age-period 55-59 (90 per cent. of pathological lesions), and lowest in the period 85-89 (27.3 per cent). Senile degeneration of the macula, on the other hand, as an isolated condition, is rarest (6.4 per cent) in the age-period 55-59, and commonest (29.0 per cent.) in the period 70-74: in the period 85-89 it had much the same incidence—24.0 per cent. The incidence of cases showing a combination of the two rose gradually with advancing years, from 2.1 per cent. in the first period considered to 30.0 per cent. in the seven year interval 90-97.

Over the whole series the following relation obtained: Total occurrence of cataract, 56 per cent.; isolated lens opacity, 38 per cent.; lens opacities combined with macular degeneration, 7.1 per cent.; isolated macular degeneration, 10.2 per cent. Total occurrence of macular degeneration, 17.3 per cent.

Gjessing therefore concludes: (*a*) that senile macular degeneration is in advanced years (*i.e.*, over 55) a disease of by no means uncommon incidence. It has on the whole a more deleterious effect upon vision than has opacity of the lens; (*b*) that there is a relative antagonism between the incidence of the two diseases, and the theory of van der Hoeve is supported by statistical evidence.

W. S. DUKE-ELDER.

(2) **Marquez (Madrid).—A case of cysticercus extracted from the eye.** (**Sobre un caso de Cisticerco extraido del ojo.**) *Arch. de Oftal. Hispano-Amer.*, Tomo XXV, pp. 585-595, November, 1925.

(2) A case of the extraction of an intraocular cysticercus by **Marquez** is of some interest. The patient, a male, aged 32 years, complained of loss of vision in the left eye, which had progressed

for some years without any other symptoms, objective or subjective, beyond an occasional conjunctival injection. Central vision was "fingers at one metre," and the upper and inner field was lacking. Examination revealed, in the lower part of the globe, immediately behind the ciliary body and lens, a clear vesicle about the size of a pea, with a segmented appendage, bent upon itself, running upwards towards the lens. No movements of the parasite were observed, but ocular movements were communicated to it. Underneath the parasite was a considerable amount of exudation, both in the vitreous and underneath a detached area of the retina.

Operative removal was undertaken under local anaesthesia, an incision being made through the conjunctiva and sclera downwards and outwards beyond the region of the ciliary body at about the position of five o'clock. A pair of fine forceps was introduced, and, with the loss of a very small amount of vitreous, the cyst was extracted. Afterwards there was considerable pain which the author considers due to an aseptic inflammation comparable to that experienced after the removal of a hydatid from the abdominal cavity. In a few days this subsided, and the eye cleared up. Ophthalmoscopic examination then revealed the heaped up mass of exudate, and what appeared to be the scolex form of the parasite. A second operation was undertaken with a view of removing this, but, owing to the extremely friable nature of the mass, was found to be impracticable and the attempt was abandoned.

Subsequently the vision and tension improved, and the eye made a good recovery. W. S. DUKE-ELDER.

(3) **Fincham, E. F.—Photomicrographs of sections of the human eye.** *Trans. Optical Soc.*, Vol. XXVI, No. 3, 1924-5.

(3) This is a series of microphotographs of the eye, of the ciliary region, peripheral region of the retina, external layers of the retina, fovea, and macula in sagittal section, and transverse sections of the layer of rods and cones in the peripheral part of the retina, macula, and fovea. They are of the highest excellence both as regards the sections and the reproductions of the photographs.

In the matter of technique, **Fincham** fixes in Kaiserling's solution (a mixture of formalin, potassium nitrate, and potassium acetate), which has been known up to the present as a solution useful for preserving museum specimens as it has the property of retaining the natural colours of the specimens.

An eye preserved for 48 hours in this solution shows on opening the eye the yellow colour of the macula and the pink colour of the remainder of the retina due to the visual purple. The shape of the eye is not well maintained.

In making sections of the retina the eye was first divided after fixation and the vitreous removed, a step necessary to prevent the

shrinking vitreous from pulling the retina from the choroid. These small pieces of retina with adherent choroid and sclera were embedded in paraffin and then cut with a Cambridge microtome.

The sections were stained with acid fuchsin or with a mixture of this and orange G. These give beautifully sharp differentiation of cytoplasmic structures.

CHARLES GOULDEN.

(4) **van der Hoeve, J. (Leiden).—Skiagraphy of the optic foramen in tumours and diseases of the optic nerve. (Röntgenphotographie des Foramen opticum bei Geschwülsten und Erkrankungen des Sehnerven.)** *Arch.f.Ophthal.*, Vol. CXV, 1925.

(4) **van der Hoeve** illustrates by two cases, one of neurofibromatosis of the optic nerve, the other an endothelioma of the optic nerve sheaths, the information, valuable both for prognosis and treatment, that is obtainable from a study of skiagrams of the optic foramen. Apart from its value in detecting fissures, fractures, or callus in the bone surrounding the optic foramen, or in suggesting the probability of a new-growth by the presence of abnormal shadows, skiagraphy may be usefully employed to study the size and shape of the foramen, particularly when the photographs are obtained by the method of Rhèse for examination of the ethmoidal cells, because it may have a bearing both on diagnosis and treatment.

As to diagnosis, in cases where there is a suspicion of tumour of the optic nerve an unduly large foramen indicates the great probability that the tumour is penetrating through the optic canal into the cranial cavity : the absence of any enlargement, however, does not negative the invasion of the canal by the new-growth or disprove the possibility of an intracranial and an intraorbital growth. The author emphasizes the necessity of making an X-ray examination of the optic foramen at intervals in cases of optic nerve tumours in order to detect any increase in the size of the foramen, which would indicate an increase in the tumour.

An abnormally small or much deformed foramen in cases of optic atrophy and neuritis, or in disease of the optic nerve in tower-skull may be suspected as a predisposing factor in the causation of the change in the nerve. As regards treatment, where the optic canal is enlarged or constricted one must consider whether it is desirable to remove the roof of the canal or to attack the new growth. The indications for such procedure must be controlled by the danger to the life or vision of the patient. As regards the vision, van der Hoeve thinks the operation should be undertaken only when total blindness is threatened.

THOS. SNOWBALL.

(5) **Blatt (Roumania).—The problem of the partial and total transplantation of eyes. (Das Problem der partiellen und totalen Augentransplantation.)** *Arch.f. Ophthal.*, Vol. CXIV., 1924.

(5) **Blatt** was induced to repeat the experiments made by Koppányi (*vide Brit. Jl. of Ophthal.*, Vol. VIII, p. 486, 1924), who claimed to have transplanted eyeballs *in toto* with great success from a functional as well as an anatomical point of view, and in recording his results he first gives a wide survey of the whole question of regeneration and transplantation in the lower animals and in man.

The author employed 400 freshwater fishes, eighty rabbits, and forty fowls, and out of these the transplanted eyes were retained, with slight changes in the refractive media, in 26 fishes and only two rabbits. In the case of the fishes observations to test the re-acquirement of vision in the transplanted eyes were made on their behaviour in the presence of a bright light and on feeding, their attitude in swimming and their change in colour and it was definitely found that they behaved in exactly the same way as blind fishes. The same negative result as to vision was obtained in the two rabbits in which the eyes were retained. In the fowls the transplanted eye was in every case lost.

Heteroplastic transplantation of an eyeball, the author adds, has been tried in man but never with lasting success and on theoretical grounds as well as on account of the technical difficulties involved it is very questionable whether the homoioplastic method would be attended with better result.

THOS. SNOWBALL.

BOOK NOTICES

Disc-shaped Degeneration of the Central Parts of the Retina. (Die Scheibenformige Entartung der Netzhautmitte.) By PAUL JUNIUS and HERMANN KUHNT. Berlin: S. Karger, 1926.

This book is a very remarkable example of perfect production. The paper, printing, and the excellence of the many coloured illustrations, are extraordinarily good. We gather from a note in the introduction that the cost of production was partially defrayed by a "German Science Necessities Fund." This fund apparently is prepared to help in the production of scientific work which would be impossible on ordinary commercial lines.

In essence the book consists of a full description of ten cases of this rare affection. There are also references to cases from the literature. Under the description "Disc-Shaped Macular Disease"

the authors understand those cases of macular degeneration accompanied by haemorrhage, with or without exudate, which have been described in this country by Rayner Batten as " Peculiar symmetrical swellings in the macular region," and by Lawford as "Subretinal new growth." There is also a case described by Hutchinson in 1876 as "Symmetrical central choroido-retinal disease," and there are many other similar observations. The authors come to the conclusion that the disease originates in some affection of the capillary vessels of the central retinal area, permitting blood exudation and causing degeneration of the tissues concerned. There is frequently an accompanying degeneration of the chorio-capillaris. The characteristic shape of the macular affection is to be explained by the peculiarity of the vascular distribution of this region, and in this connection it is of interest to recall the remarks of Percival Hay on "The Nutritive Supply of the Macular Region" given in the Transactions of the Ophthalmological Society of the United Kingdom of 1921.

This book will repay careful study by all who are interested in this fascinating but obscure field of retinal disease.

Colour Blindness. By JULIA BELL, M.A., M.R.C.S., L.R.C.P. With plates XXVII-XLI and frontispiece portrait of John Dalton; pedigrees 367-602. Eugenics Laboratory Memoirs, XXIII. The Treasury of Human Inheritance, edited by Karl Pearson, F.R.S., Vol. II Anomalies and Diseases of the Eye. Nettleship Memorial Volume, Part II. Cambridge University Press, 1926. Price 45 shillings net.

The chief value of this work consists in the collection of pedigrees of colour blindness, with as exhaustive notes as it has been possible to obtain of the individual cases. As Miss Bell herself says (p. 196): "with regard to the pedigrees themselves the material is such as to make the statistician thoroughly unhappy, for we know perfectly that a large proportion of those individuals entered as normal have not been scientifically tested, and we know also that many of the cases amongst the earlier published records have been tested by means of wools alone which may be entirely misleading." None the less, the work was well worth doing and has been done excellently. It will be long before more accurate records can be collected and collated, but it is to be hoped that attention in the immediate future will be directed to the thorough scientific investigation of all the members of a few carefully selected pedigrees. It has been impossible in the present collection to distinguish the types of partial colour blindness, but the differences in protanopic and deuteranopic cases are so pronounced that it is not safe to conclude that they follow the same laws of inheritance or are mixed

in the same pedigrees. The impossibility of distinguishing the milder forms (protanomalous and deuteranomalous)—not to speak of other anomalies, such as a shift of the sensation curves—by crude methods of examination introduces the probability of serious errors in the pedigrees and the results which can be deduced from them.

Miss Bell has written quite an extensive thesis on colour blindness as an introduction to the pedigrees. This is quite admirable, so far as it goes, especially in the cautiousness of her treatment of theories and the deductions therefrom. The introduction is divided into three parts: (1) Colour Vision and its Anomalies; (2) Total Colour Blindness; (3) Congenital Colour Blindness. Of these that on total colour blindness is by far the best, and could scarcely be improved in the space allotted to it.

The first part commences with an historical account going back to Galen and Hippocrates. Interesting as it is, we think that it, and some other of the sections less pertinent to the main object of the thesis might, in the interests of economy, have been published elsewhere; for we fear that the cost of the production may limit its dissemination. In fact, we think that the whole of this part, dealing with normal colour vision, the solar spectrum, the structure of the human retina, on the association of retinal structure and function in man and in animals, the neuro-epithelial layer of the retina, and colour vision in animals might have been treated more cursorily, for these subjects cannot be adequately dealt with in the space allotted, have been discussed more fully in readily accessible works, and should be familiar to all who are sufficiently interested in the subject to turn their attention to the inheritance of anomalies.

No attempt is made in the third part to discuss so exhaustively the ordinary forms of colour blindness and the multitudinous theories on the subject. Here, and quite rightly in our opinion, stress is laid upon the frequency of colour blindness, its incidence in women, and its inheritance. The heading "Congenital Colour Blindness," though sanctified by usage, is not very happy at any rate without the qualifying adjective "partial."

All these criticisms are, however, of quite secondary importance as compared with the value of the work as a whole. The author expresses her indebtedness to Mr. C. H. Usher, who with his usual modesty well-nigh effaces himself; but a mere glance at the pedigrees proves that his aid and the pioneer work and inspiration of Mr. E. Nettleship to whom the work is dedicated, are responsible for the best and most complete pedigrees in the collection.

Sumptuous seems to be the only word which is adequate to describe the form and printing of the book.

CORRESPONDENCE

TRACHOMA

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—The article "Trachoma in Palestine," which appears in your May issue refers to the stages of trachoma without stating the origin of this classification. This will be found under my name in the *Compte-Rendu of the International Congress of Medicine*, Budapest, 1910. It was also reported in the *Ophthalmoscope*, September, 1909, in the *Ophthalmic Record*, December, 1910, and in the *Archives d'Ophtalmologie*, September, 1911. I had occasion to point out in the *Lancet* of February 17, 1923, that the Zionist organization, to which the author of "Trachoma in Palestine" belongs, although in receipt of all reports on ophthalmic subjects from the Egyptian Government, seemed chary of acknowledging the source of their inspirations.

Without a classification of the stages of trachoma it is impossible to understand the progress of the disease, or the principles of its treatment. With your permission I will briefly indicate the stages referred to adopted for teaching purposes long ago by E. Fuchs, and now used by Lindner. They are as follows:

Trachoma Stage I.—Tiny follicles, like grey pins' heads, appear on the conjunctiva of the upper tarsus. They are quickly followed by the appearance of trachomatous pannus, or vascularization of the clear cornea at its upper border; this can only be seen with a slit-lamp, or with a good compound lens and satisfactory focal illumination.

Trachoma Stage II is divided into trachoma II*a*, trachoma II*b*, and trachoma II*c*. Trachoma II*a* is characterized by the predominance of gelatinous follicles, while trachoma II*b* is characterized by a papillary hypertrophy which coexists with the follicles. Trachoma II*a* is accompanied by a discharge from the conjunctiva and on this account is particularly contagious. Trachoma II*a* exhibits numerous greyish follicles which protrude above the surface of the conjunctiva, they easily rupture when manipulated, allowing their gelatinous contents to escape. Exactly how or why trachoma I passes into trachoma II is not certain, perhaps as the result of organisms other than those which are the aetiological factor in trachoma. Trachoma II*b* is characterized by the formation of red raspberry-like papillae which mask more or less the typical gelatinous follicles. Two sub-varieties are distinguished, trachoma II*b*′, and trachoma II*b*″. Trachoma II*b*′ is unmixed trachoma, while trachoma II*b*″ is trachoma complicated with spring catarrh. Trachoma II*c* is trachoma complicated by

a superadded bacterial infection with the Koch-Weeks bacillus or the gonococcus, or the Morax-Axenfeld bacillus, or other organisms.

Trachoma Stage III.—In this stage cicatrization has begun, or is more or less advanced. Islands of inflamed conjunctiva or of trachomatous follicles are seen to be surrounded by a network of fine lines of connective tissue. Pannus may greatly interfere with vision. In this stage entropion and trichiasis develop. Trachoma III may relapse into trachoma II, or cicatrization may advance to a cure of the disease, the stage trachoma IV. The stages are described more fully in my book on trachoma, now out of print.

The importance of treating trachoma in the schools of a trachomatous country cannot be overestimated, as Dr. Shimkin points out. In Egypt, at all the Government Primary Schools, this is carried out by an ophthalmic surgeon in a special room on five days of the week throughout the school year. The organization has been described in the Annual Reports of the Ophthalmic Section of the Department of Public Health, Egypt, from 1912 to 1921.

Yours faithfully,

A. F. MACCALLAN.

NOTES

Advanced Course on Spectacles

AN advanced course on spectacle work will be held at the University Eye Clinic, Bâsle, from October 18 to 23. The demonstrators are Brückner (Bâsle), Erggelet (Jena), Hallauer (Bâsle), Hartinger (Jena from Zeiss's), Hegner (Lucerne), von Rohr (Jena). Fee for the course 50 Swiss francs. Those desirous of attending should send their names to the Unversitäts Augenklinik, Bâsle, Mittlerestrasse 91.

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Obituary

WE regret to announce the death of Dr. E. Landolt in his 80th year at Paris on May 9. We propose to publish an obituary notice in our next number.

FUTURE ARRANGEMENTS

1926

July 14—17.—Oxford Ophthalmological Congress.

July 21—23.—British Medical Association at Nottingham.